Science WONDER Stories

Sept

25 Cents

Canada 30¢

HUGO GERNSBACK Editor

A GERNSBACK PUBLICATION

Science Stories by

ED. EARL REPP

DR. DAVID KELLER

REV. LOUIS TUCKER, D.D.

PAUL

FREE!

MEN! Here's the dope you've been looking for

HOW TO GET INTO THE RADIO BUSINESS~

J.E.S.

Many Earn $50 to $250 a Week in Work That is Almost Romance

If you're earning a penny less than $50 a week, clip coupon now for FREE BOOK! New 64-page book pictures and tells all about the Radio business, hundreds of opportunities—in work that is almost romance! YOU can learn quickly and easily at home, through my tested, proved methods to take advantage of these great opportunities! Why go along at $25, $35, or $45 a week when you can pleasantly and in a short time learn how to hold the big-pay jobs?

I Give You 6 Big Outfits of Radio Parts

With them you can build 100 different circuits—learn the "how" and "why" of practically every type of Radio set made. This kind of training fits you to step into the good jobs—sends you out an experienced Radio expert. When you complete, my Employment Department will help you get a big Radio job like Graduate Edward Stanko, chief operator of Station WGR, or Frank M. Jones, 922 Guadalupe St., San Angelo, Texas, builder and operator of Station KGFI and manager of the best equipped Radio shop in the southwest, or help you start a Radio business of your own like Richard Butler, 1419 N. 17th St., Philadelphia, Pa., who made around $500 a month compared with a job as a motorman when he enrolled.

My Radio Training is the Famous "Course That Pays for Itself"

Spare time earnings are easy in Radio almost from the time you enroll. C. W. Page, 1807 21st Ave. S., Nashville, Tenn., made $935 in his spare time while taking this course. Al Johnson, 1409 Shelly St., Sandusky, Ohio, $1,000 in four months, and he didn't know the difference between a condenser and a transformer when he enrolled. I'll give you a legal contract, backed by N. R. I., pioneer and largest home-study Radio school in the world, to refund every penny of your money if you are not satisfied, upon completing, with the lessons and instructions received. Find out what Radio offers you—get the facts. Mail coupon—RIGHT NOW.

I Have Trained Hundreds of Men at Home for Big Radio Jobs. My Book Proves I Can Do the Same for You.

Clip Coupon for Free Book

Don't envy the other fellow who's pulling down the big cash! My proven home-study training methods make it possible for you, too, to get ready for better jobs, to earn enough money so you can enjoy the good things of life. One of the most valuable books ever written on Radio tells how—interesting facts about this great field, and how I can prepare you in your spare time at home, to step into a big-pay Radio job. GET THIS BOOK. SEND COUPON TODAY.

J. E. SMITH, Pres.
National Radio Institute
Dept. 9WA1
Washington, D. C.

Radio Needs Trained Men

J. E. SMITH
President
National Radio Institute
Dept. 9WA1
Washington, D.C.

Dear Mr. Smith: Without obligating me in any way, send me your big FREE BOOK, "Rich Rewards in Radio," and all information about your practical, home-study Radio Course.

Name ..... Age.....

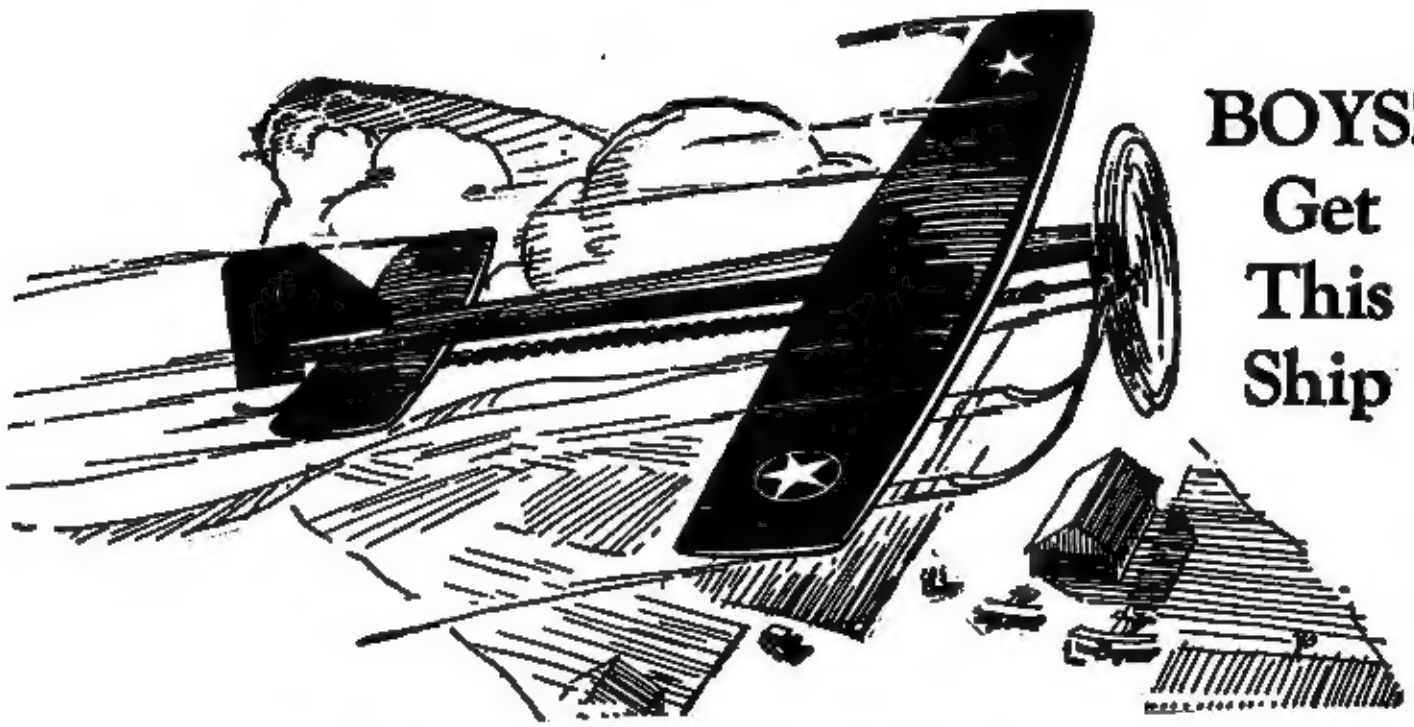
Address .....

Town ..... State .....

ACT NOW~COUPON BRINGS MY FREE BOOK

A Supreme Achievement in a Model Plane

The RED ACE *Combat Pursuit Ship*



BOYS! Get This Ship

Rises from Ground—Soars 60 Feet

The development of the Red Ace Combat Pursuit Ship will be nothing short of sensational in the world of model planes. Here's one plane that will not disappoint you—one plane that will perform like a real ship. Has wing spread 16" with main fuselage 14"; reinforced main wing; perfectly balanced tail wing and adjustable rudder. Main wing can be shaped to suit conditions. Has front landing gear and rear skid. The perfectly carved 7" wood propeller is a particularly fine feature. Has ball bearings on propeller shaft; 6 ply motor of newly developed extra strong para rubber. This is not a construction set, but a completely assembled plane. Simply fasten wings and launch.

Will Outperform Planes Costing 5 Times More

The Red Ace will rise from ground under its own power. Will climb easily to 60 feet. Will soar over rooftops and buildings. Then, glide perfectly to earth. This large-sized, carefully made plane will outperform many planes costing 5 times more. It is guaranteed to fly. It is guaranteed to rise from the ground under own power. This plane will please any boy immensely. A perfect marvel of simplicity and powerful performance. Whether you now own a model plane or not, whether you own 50 model planes, you will want the Red Ace. It will be the prize ship in your hangar. Don't let a day slip by until you order this plane.

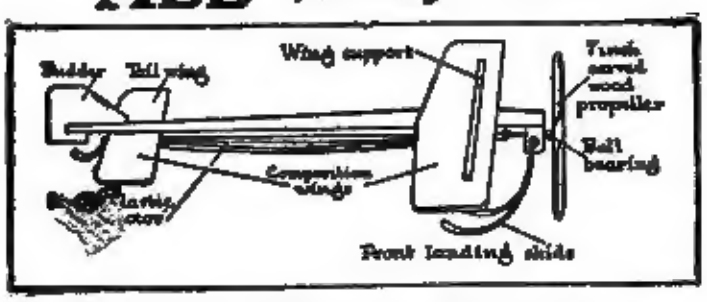
You May Have It FREE!

The Open Road for Boys Magazine has 50 pages every month crammed with thrilling, breath-taking stories that will hold you spellbound. Just the kind of stories you've been looking for. Interesting, tense stories of high adventure on land and sea and in the air. Tales of deep mystery. Airplane stories, the best published. Sport stories, stories of school life. Marvelous departments and special instructive articles. Lots about model planes. The Open Road for Boys is the fastest-growing boys' magazine in America. You'll think it is great! Regular subscription price $1 a year. Rush us your subscription today on coupon below and we will give you free the Red Ace Combat Pursuit Ship. But you must act at once.

Hurry Your Order→ TODAY

Look at These Great Features

ALL *for only* $100



The Red Ace is a plane so carefully thought out, so cleverly constructed that it will enable you to compete with other boys with the most expensive planes, and win! This plane is a remarkable performer—a plane that you will be proud to own.

This Is a Great Bargain Offer

Pilot Barclay, Open Road for Boys,
130 Newbury St., Boston, Mass.

Canadian postage 50c extra.
Foreign $1 extra.

Friend:
Bet your life! I will grab the big offer. Here's my dollar. Put me down for a year's subscription to The Open Road for Boys and rush me the Red Ace Combat Pursuit Ship.

Name .....

Street .....

Town or City .....

State .....

Vol. 1, No. 4

Publication Office, 404 North Wesley Ave., Mt. Morris, Ill.
Editorial and General Offices, 96-98 Park Place, New York City.

SEPTEMBER, 1929

Published by
STELLAR PUBLISHING CORPORATION
H. GERNSBACK, Pres. I. S. MANHEIMER, Sec'y. S. GERNSBACK, Treas.

Table of Contents

September

THE HUMAN TERMITES
(A Story in Three Parts) (Part I)
By David H. Keller, M.D. 294

THE CUBIC CITY
By Louis Tucker 316

THE ONSLAUGHT FROM VENUS
By Frank Phillips 326

THE RADIUM POOL
(A story in two parts) (Part II)
By Ed Earl Repp 344

THE PROBLEMS OF SPACE FLYING
(Conclusion)
By Capt. Hermann Noordung, A.D., M. E. 361

WHAT IS YOUR SCIENCE KNOWLEDGE?
Science Questionnaire 369

SCIENCE NEWS OF THE MONTH 370

THE READER SPEAKS
Letters from Our Readers 374

ON THE COVER

this month is illustrated Mr. Frank Phillips' story "The Onslaught from Venus." Here we see the gigantic digging machines of the Venus People in operation, while in the background, one of their heat machines is turning out molten lava made from rock and earth, and which later will be used to make building blocks for these invaders. As observed the digging machines with almost human accuracy carry the lava away.

NEXT MONTH

THE METAL WORLD. By Ed Earl Repp. The author of "The Radium Pool" has come forward with his latest offering, written in a style sure to arouse your enthusiasm. It has often been said by our foremost scientists that life is possible under the most adverse conditions. Seemingly, the human race finds it possible to propagate as easily in the North Polar regions as under the broiling sun of the Equator. On the other hand, the human race can endure at some of our highest mountain tops, where the lack of air is notable, and humans can exist in deep caves for years without being the worse for it. Don't fail to read this story.

FROM EROS TO EARTH. By Walter Kateley. The author of this story was formerly connected with the U. S. patent office and is for that reason well qualified as a science fiction writer. He has given us a most excellent interplanetarian story of a different sort. Not all interplanetarian stories have to do with space flyers and the visiting of other planets by earth men. This story is one that deals with a new and novel theme, one that will hold your interest due to its captivating charm as well as its unusual array of scientific ideas.

THE ANCIENT BRAIN. By A. G. Stangland. That the idea of suspended animation is not mere fiction, is best proved by the fact that you can take fish and other animals and freeze them solid and keep them in this condition for a considerable length of time. After thawing, they seem to be as well-off as before. Other animals, notably bears, can hibernate during the entire winter months without being the worse for it. Mr. Stangland has enlarged on this theme in a most surprising manner, and incidentally, has created a rattling good story that cannot help but keep your intense interest.

IN TWO WORLDS. By Edward E. Chappelow. Here is one of the most daring stories of imagination that we have read in a long while. It is one of those stories that grows upon you as time goes on. It not only gives you a world of information on a subject of which not too much is known, even by our foremost scientists, but provides a source of the most interesting speculation about the possibility of there existing worlds within worlds, *ad infinitum*. We then may well wonder what part of the scheme our world consists of.

AND OTHERS

SCIENCE WONDER STORIES is published on the 3rd of the preceding month. 12 numbers per year, subscription price is $1.50 a year in United States and its possessions. In Canada and foreign countries, $2.00 a year. Single copies 20c. Address all contributions for publication to Editor, SCIENCE WONDER STORIES, 96-98 Park Place, New York. Publishers are not responsible for lost Mss. Contributions cannot be returned unless authors remit full postage.
SCIENCE WONDER STORIES—Monthly—Entered as second class matter in the Post Office at Mt. Morris, Ill., under act of March 3, 1879. Title registered U. S. Patent Office. Trademarks and copyrights by permission of Gernsback Publications, Inc., 96 Park Place, New York City, owners of all trademark rights. Copyright 1929, by G. P., Inc. Text and illustrations of this magazine are copyright and must not be reproduced without permission of the copyright owners.
SCIENCE WONDER STORIES is for sale at principal newsstands in the United States and Canada. European agents: Erasmus's, London and Paris. Printed in U. S. A.
IF YOU WISH TO SUBSCRIBE to SCIENCE WONDER STORIES, make out all remittances to the Stellar Publishing Corp. Be sure to mention the name of magazine you wish to subscribe for, as we are also agents for the following magazines: RADIO-CRAFT and AIR WONDER STORIES, subscription price of which is the same as SCIENCE WONDER STORIES. Subscriptions can be made in combination with the above publications, at a reduced club rate. Ask for information. Subscriptions start with current issue. WHEN YOUR SUBSCRIPTION EXPIRES, we enclose a renewal blank in the last number. No subscriptions continued unless renewal remittance received.
Change of Address. Always give us old as well as new address and notify us as far in advance as possible.

STELLAR PUBLISHING CORPORATION
Editorial, General and Advertising Offices, 96-98 Park Place, New York City
Publication Office, 404 North Wesley Avenue, Mt. Morris, Illinois.

NEW SCIENCE FICTION SERIES

Brand New Series

We are presenting to our readers the first six numbers of our new *Science Fiction Stories*. These small books, illustrated by artist Paul, are printed on a good grade of paper and are sold at a low price, due to the large amount put out. New ones will be issued from time to time.

REMEMBER THESE ARE BRAND NEW STORIES AND HAVE NOT BEEN PUBLISHED BEFORE IN ANY MAGAZINE. THEY CAN ONLY BE SECURED THROUGH THE SCIENCE FICTION SERIES.

Every book contains but a single story by a well-known science fiction author. The type is large and well-readable, and the size of each book is 6x8 in., which makes it convenient to carry in your pocket.

Below you will find a list of the first six books. Your choice of five books for 50c or the entire six books for 60c prepaid. Not less than five books sold.

1—THE GIRL FROM MARS
By Jack Williamson and Miles J. Breuer

Suppose some one from another planet landed on our earth. What would happen? "The Girl from Mars," is an adventure of a Martian visitor, with all the strange situations that one can imagine in such an event.

2—THE THOUGHT PROJECTOR
By David H. Keller, M.D.

The power of suggestion on the human mind forms the basis of "The Thought Projector." Ideas repeated over and over exert a great force on us. They penetrate our minds and give us ideas that we often think are our own.

3—AN ADVENTURE IN VENUS
By R. Michelmore

Aviation five hundred or a thousand years hence will probably be something beyond most of our present conceptions. Journeys to other planets may well become a commonplace as it does in the present story.

4—WHEN THE SUN WENT OUT
By Leslie Stone

The sun is said to be slowly cooling, and generations many thousands of years hence must face the problem of how their heat and light is to be provided when the sun's end does come. In this thrilling story, Leslie Stone answers that question.

5—THE BRAIN OF THE PLANET
By Lilith Lorraine

If a super-intelligence could have its wisdom poured into our brains, what a different world we might have. Miss Lorraine poses such a problem and works out the answer in an astounding manner.

6—WHEN THE MOON FELL
By Charles H. Colladay

Collisions between celestial bodies of any size have not occurred within historical times. But such an event is not an impossibility. In fact many astronomers believe that our solar system came into being by such a collision. Suppose the moon were to crash into the earth. What would happen?

STELLAR PUBLISHING CORP.,
S.W.-9 66 Park Place, New York, N. Y.

Gentlemen:

I am enclosing herewith $.....for which please send me prepaid books which I have marked with an X:

[ ] 1 THE GIRL FROM MARS
[ ] 2 THE THOUGHT PROJECTOR
[ ] 3 AN ADVENTURE IN VENUS
[ ] 4 WHEN THE SUN WENT OUT
[ ] 5 THE BRAIN OF THE PLANET
[ ] 6 WHEN THE MOON FELL

Name _____

Address _____

City _____ State _____

25c.
THE COPY
On All
Newsstands

The 100% Radio Magazine

Catering only to the

RADIO AMATEUR
CUSTOM SET BUILDER
PROFESSIONAL SET BUILDER
RADIO ENGINEER
***and* SERVICE MAN**

Contents of September Issue:

The A. C. Screen-Grid Peridyne
By Hugo Gernsback

The Problems of Television
By D. E. Replogle

A Bureau of Standards Audio Amplifier
By S. R. Winters

The Screened-Loop Antenna
By Baron Manfred Von Ardenne

Making Low-Loss Coils
By C. W. Teck

The Resonance-Wave Tuner
By S. R. Winters

Cone Pulleys Solve Television Synchronizing
By C. Sterling Gleason

From Microphone to Modulator
By C. Sterling Gleason

The Sun Short-Wave Tuner
By Jack Grand

Latest Things in Radio

Radio-Craft Kinks

Service Man's Data

Servicing Broadcast Receivers
By Julius G. Aceves

Putting New Life in Old Supers
By R. H. Siemens

The Cooperative Radio Laboratory
Conducted by David Grimes

Information Bureau

A GERNSBACK PUBLICATION

Regular Subscription Rates

$2.50 in U. S. **25c. a copy**

$3.00 in Canada and foreign

SPECIAL OFFER

One Year for $1.25

TECHNI-CRAFT PUBLISHING CORP.,
96-98 Park Place, New York, N. Y. **Dept. S-9**

Enclosed please find $1.25 for which send me RADIO-CRAFT for the next 12 months.

Name _____

Address _____

City and State _____

VOLUME 1
No. 4

Science WONDER Stories

SEPTEMBER
1929

Editorial, Advertising and General Offices, 96-98 Park Place, New York, N. Y.

• • • • • Prophetic Fiction is the Mother of Scientific Fact • • • • •

HUGO GERNSBACK, *Editor-in-Chief*

DAVID LASSER, *Literary Editor* FRANK R. PAUL, *Art Director*

ASSOCIATE SCIENCE EDITORS

ASTRONOMY
Professor Samuel G. Barton
Flower Observatory, University of Pennsylvania.
Dr. Clyde Fisher, Ph.D., LL.D.
Curator, The American Museum of Natural History.
Professor Willem J. Luyten, Ph.D.
Harvard College Observatory.

ASTROPHYSICS
Donald H. Menzel, Ph.D.
Lick Observatory, University of California.

BOTANY
Professor Elmer G. Campbell
Transylvania College
Professor Margaret Clay Ferguson, Ph.D.
Wellesley College
Professor C. E. Owens
Oregon Agricultural College

CHEMISTRY
Professor Gerald Wendt
Dean School of Chemistry and Physics
Pennsylvania State College

ELECTRICITY
Professor F. E. Austin
Formerly of Dartmouth College.

ENTOMOLOGY
William M. Wheeler
Dean, Bussey Institution for Research in Applied Biology, Harvard University.

MATHEMATICS
Professor C. Irwin Palmer
Dean of Students
Armour Institute of Technology
Professor James Byrnie Shaw
University of Illinois
Professor Waldo A. Titsworth, S.M.
Alfred University.

MEDICINE
Dr. David H. Keller
Western State Hospital

PHYSICS AND RADIO
Dr. Lee deForest, Ph.D., D.Sc.

PHYSICS
Professor A. L. Fitch
University of Maine

PSYCHOLOGY
Dr. Marjorie E. Babcock,
Acting Director, Psychological Clinic, University of Hawaii

ZOOLOGY
Dr. Joseph G. Yoshioka
Illinois State Institute for Juvenile Research

These nationally-known educators pass upon the scientific principles of all stories.

HIDDEN WONDERS

By HUGO GERNSBACK

THE greatest sources of wonder are not those that we see or those indeed we know, but those which are hidden from us and are going to be known only as we progress on our long and tortuous road to the future. If we contemplate the world as it was, let us say, 100,000 years ago in the day of the cave-man, this truth must become most apparent to us; yet it is often overlooked or not at all appreciated.

Every man-made work from the modern skyscraper down to the most intricate chronometer that we have today, was in existence 100,000 years ago in its integral parts. All the raw materials were there as they are today. Nothing has been added to the wealth of the earth during the last 100,000 years, with the possible exception of some falling meteorites.

Yet humanity at that time was nothing more than a race of animals emerging from a long sojourn in savagery. Everything that spells our civilization today, was hidden from our ancestors. It is safe to presume that it will always be thus and that we, who call ourselves moderns of today, have hidden from us just as many things as our ancestors had hidden from them 100,000 years ago.

It is true that, in the last 150 years, more things have been revealed to the human race than in 50,000 years preceding this epoch; but, even now, we have as yet not scratched the surface of the possibilities of nature, or come anywhere near the limit of our progress.

There are immeasurable treasures surrounding us—treasures in power, treasures in foodstuffs and other treasures necessary for life—but we do not use them because we do not know how to get at them.

As late as a hundred years ago, people in England as well as Pennsylvania, were burning wood in the winter to keep warm because they had always done so; yet they built their houses right on top of coal veins which they assumed to be only a form of rock. It took humanity over 100,000 years to arrive at the point where it burned this "rock" and found it would give them heat.

This of course sounds ludicrous to us today, yet we are just as foolish when we insist we must burn coal in order to make steam of it, which in turn is used to run our turbines, which turn dynamos which produce the current to light our electric lamps. In this process, we lose exactly 99.8% of the available power and only 2/10 of 1% of the energy is turned into light, the rest escapes in heat and other losses.

Untold sources of power are lying right at our own door, but as yet we are unaware of it. If we had the key to unlock the secret of atomic power for instance, every single pebble in your backyard could be turned into enough heat, light and power to keep your house supplied for years to come. But of course, we haven't got the key, because as yet it is hidden from us.

Yet we need not go as far as atomic power. There are probably—and scientists have suspected this for many years—many other sources of power surrounding us, which as yet have not been harnessed. There is for instance, gravitation; there is the pressure of light; there is the electric energy that comes direct to us from the sun, in addition to the radiant heat—a vast source of power as yet only little understood.

It takes generations of steady plodding to discover some of these hidden sources of power. One for instance, that probably will become a tremendous factor in the future, the so-called cosmic ray, was recently discovered by Professor Milliken. We know practically nothing about it as yet, but from the little we have seen, we suspect it is a terrific power that some day will be tapped to the benefit of humanity.

The sources of energy created by the differences in temperature around us have never been tapped. Only recently a Frenchman proposed a most unique plan, whereby a tremendous amount of power can be taken from the oceans, through simply taking advantage of a small variation of temperature existing between that of the sea level and that a little distance below the surface.

Then, there are the tremendous sources of solar heat, the tides, winds, and others, which although they are known to us, might just as well be hidden away, because we have as yet not the sense to make use of them. Yet each of them offers enough power to supply all the needs for the entire planet.

Fabulous wealth will be made in the coming generations by those who will tap some of these hidden or unused sources of power and add them to our natural resources, without ever fearing in the least to deplete the source. Coal and oil, for instance, will some day give out; whereas the solar heat, the tides, radiant heat and other forces will keep on giving energy for literally millions of years to come.

The Human Termites

by David H. Keller, M.D.

I made a machine which would enable me to look right through the wall of the colony house. Now I could see the life lived there and hear it too, and obtain the harmony between sight and sound.

THE HUMAN TERMITES

FOREWORD

> **Dedication**
>
> *Much of what we are in life and the greater part of what we do is made possible by the previous efforts of some worker who may have all unknowingly, laid the foundations for our achievements. It is therefore with due appreciation that this work of science-fiction is dedicated to Maurice Maeterlinck, author of "The White Ant."*
>
> DAVID H. KELLER, M.D.

IN the latter part of April, 1929, during a visit to New York, I was entertained one evening by Mr. and Mrs. Hugo Gernsback. They had done me the honor of having me to dinner in their home instead of the more formal surroundings of one of the great Metropolitan hotels. After dinner the three of us discussed various phases of social life in New York. I admitted that the city had its charms but that personally I should not care to live amid the constant din and confusion. Mr. Gernsback laughed at me as he said:

"But you should come to see us more frequently. Everytime you come you secure ideas for several stories."

"I admit that," I replied. "For example, large blocks of conversation in *'Stenographer's Hands'* were obtained from your conversation. At the same time, you must admit that some of the ideas in my stories are original. The hard thing is to get a new idea. Just one absolutely original idea makes a story possible."

My host pondered for a moment and then walked over to his library and picked up a book.

"Here," he said, "is an idea for a story. This book is 'THE WHITE ANT' by Maurice Maeterlinck. He tells about the termite and suggests that the conduct of the individual ant may be controlled by a central intelligence, and that the termitary is really one large individual animal." Mr. Gernsback half-seriously then suggested that all life may be that way and that the human being may be controlled by a central intelligence. He felt that this may account for the fact that individuals in different parts of the world often do the same thing at almost the same time.

"For example," he went on, "Elisha Gray and Alexander Graham Bell, working independently, arrived simultaneously at the idea of the telephone and submitted the invention to the patent office within an hour of each other. Darwin and Charles Buell announced from different parts of the globe their conclusions regarding natural selection at practically the same time. Let me read parts of this book to you." For fifteen minutes he read to me, while I sat in an easy chair with closed eyes. Finally he said:

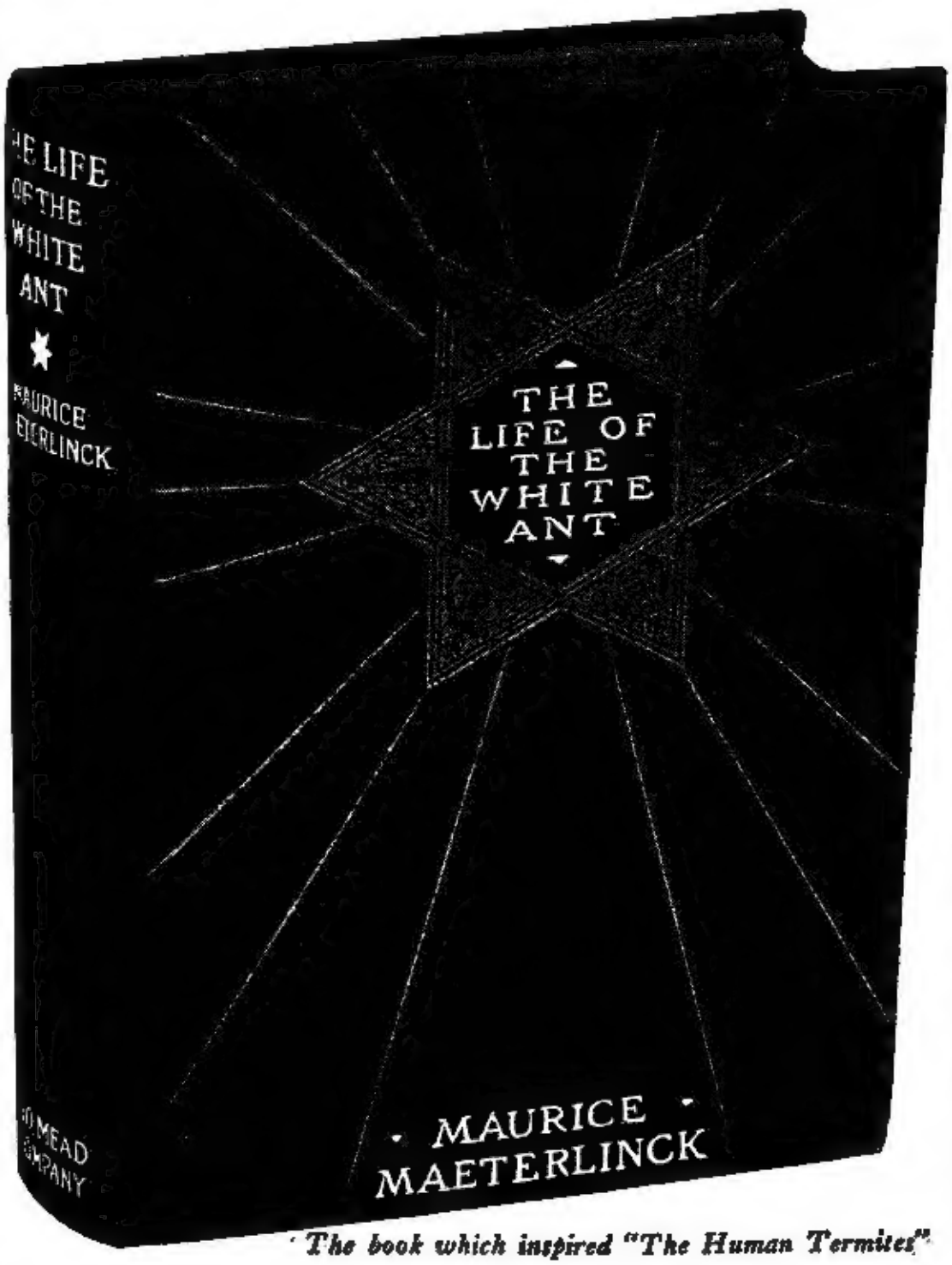
"You take this book with you and read it. There is a big story in it. I give you *one idea. All you have to do is to work out the details.*"

"Yes," I replied, "that is ALL, but that *is a good deal* some times."

The next day I read the book on the train between New York and Stroudsburg. By the time I stepped off the train the idea was ready for the typewriter. It was written at white heat and finished in less than two weeks. Mr. Gernsback was kind enough to say that it was my best science fiction story. But he quite naturally believes that it could not have been written without his idea. Editors are that way! (Unfortunately true.—*Editor*). And I am conceited enough to feel that even *with* the idea, he needed me to write the story. (Dr. Keller infers that the Editor could never have written "The Human Termites" even though he had the idea. The Editor cheerfully admits this. As a matter of fact few authors could have written such a marvelous story as Dr. Keller has—*Editor*).

This, at least is the way one story came to be written.

David H. Keller, M.D.



The book which inspired "The Human Termites"

HANS SOUDERMAN had just returned from a residence of many years in Africa. There he had lived the solitary life of one who is occupied in solving a certain mystery of life and cannot be content with any other occupation or satisfied till a solution of the problem has been attained. Such men have made our civilization possible; they are not good companions on account of their intense introversion, but on the rare occasions when they can be induced to talk about their work they are always able to astonish their audience with their erudition and complete mastery of their life work.

Such a man was Souderman. For some reason, early in life, he had been stimulated to entomological research. For years he had followed in the footsteps of Forel, Charles Janet, Lubbock, Wasmann and Maeterlinck. He had learned all that these masters of insect life had to teach him, but because he was born of woman he was not satisfied with this knowledge. There were too many gaps in the knowledge of his teachers, too many places where they said, "I do not know." He realized that he could not fill all of these gaps, unravel the twisted thread of all the mysteries of insect life that had puzzled them, but he did feel that life was going to be a failure to him, and completely unsatisfactory, unless he made at least one contribution to the knowledge of the insect world. The work of Forel and Maeterlinck intrigued him but left him restless, unsatisfied and discontented. He wanted to find one fact that was unknown to them, solve one puzzle that they had been unable to fathom.

It is typical of the man that he made a calm and dispassionate survey of the entire world of insects before he decided on his life work. This review of the unsolved questions of the little-known part of life formed by the insects brought him face to face with the Termite and its destructive powers. In the Annals of Entomology he read of the destruction of the French town of La Rochelle by termites from San Domingo, which had come in the vegetable mould in the hold of sailing vessels. Every street was attacked. Before the danger was realized most of the houses fell down. The archives and all the records were destroyed. The devastation only stopped when the termites reached the canal of La Verriere.

In 1879 a Spanish warship was literally eaten to pieces by a swarm of termite divers while anchored in the harbor of Ferro. In 1809 these same minute insects destroyed the batteries and munition of the French forts in the Antilles, and made the defence of those islands against the English an impossibility. Souderman found that large portions of Australia and Ceylon were uninhabitable because the termites ate the crops faster than they could be grown. Europe was protected by its temperature; were it a tropical land the termite might destroy even the greatest of the cities of that land. They have to live in a temperature ranging from 20 to 36 degrees Centigrade. Below 20 degrees they die.

The more Souderman read about these tiny, blind insects, the more fascinated he was by the many startling peculiarities they possessed. He no longer felt the bee, the wasp and the ant were the intellectual leaders of the insect world, but slowly came to realize that the termite possessed a something resembling human reason which placed it not on a level with man, but perhaps in some ways above him. So he decided to devote the rest of his life to a study of the termite. Severing all relations with his European associates, securing an income from one of the large research endowment funds, he went to South Africa to study the termites, not by observing them but by actually living with them. This is a form of scientific investigation that is rare, but which never fails to repay for the years spent in its pursuit. Some day all the

WE take pleasure in presenting what we believe to be Dr. Keller's greatest work so far. That this story will cause a furore and endless discussion, seems certain. It embraces a tremendous subject and incidentally, enters into realms that are as yet but little understood even by our foremost scientists.

But you may be sure that some of the greatest mysteries that surround us and even permeate our very bodies, will be solved during the next few hundred years. For instance, as Maeterlinck asks in his book "The White Ant", what intelligence governs our own bodies?

You cut your finger and the ignorant person will say that it starts healing at once. But the process of healing means that the instant the breach is made in the skin, innumerable thousands of minute white bodies called corpuscles immediately rush to the breach and start fighting the germs that enter the opening, while new cells are being built up immediately to close the breach.

Neither the human intelligence nor the human will has anything to do with these processes, which go on at all times within the human body. All we know is that some intelligence evidently directs these things, but who or what this intelligence is, no one knows. Whether it is our little-understood so-called "soul" or something else, no one knows.

Indeed, it is not at all impossible that the members of the entire human race must be considered simply as separate cells of a great organism. They have no will of their own, but are fused into a homogeneous body with nothing but intervening air to separate.

That this may be true could be illustrated in many ways. War, for instance, will quite often change an entire nation overnight as if by magic and also change lifetime habits and ideals of its people almost as quickly. Religion, fanaticism and other passions are similar evidences of the transmission through an entire nation or nations in many instances of ideas without visible communication between individuals.

All these things may be explained by purely logical, natural reasoning without resorting to the super-natural, as indeed the author has pointed out in this memorable work. It is certainly a work that will commend itself to the earnest attention of every thinking, questioning person.

questions in the scientific world will be solved by such men as Souderman, trained laborers in the world of the unknown who are willing to sacrifice everything to obtain an answer to one mystery of life.

Something About Souderman

SUCH workers have been few. The price that has to be paid is too great. Everything has to be abandoned. A lifetime has to be spent to attain one little fact. And yet the men who do this feel that the attainment of one addition to the store of human knowledge is sufficient reward for all their sacrifice. And it is. Suppose one man spent a life time with the cancer cell, not merely studying it, but actually living with it. He would think of nothing else during his waking hours and dream only of it during his sleep. Month by month and year by year he would become more intimate with this enemy of the middle-aged. To him the cancer cell would become a separate race of living creatures, a parasitic enemy of mankind. He would learn its history, its folklore, its traditions. The cancer race would slowly reward his efforts by allowing him a few glimpses of a separate intelligence, comparable to that of the human species.

Time would pass and it might be that old age would come on and still the secret of prevention would remain a mystery. As a last resort he would deliberately inoculate himself with the cancer cell, make of his own body a laboratory so that he could make a last, final effort to gain an insight into the soul of the individual cell, the group intelligence of the cancer mass. Others would consider him insane, a recluse introverted by the study of years, an unfortunate dying of the very disease he had spent years to study. Yet even on his death bed he might whisper the great truth which would make the human race free from this parasite that now kills one out of every four who reach the age of forty. Surely this man would die happy in the thought that he had contributed one fact that would make the life of his race happier. That is the great sacrifice. Every generation produces one voluntary victim. Such a man was Souderman.

He went to Africa when he was 45. He came back when he was 75. During those years his loved ones in Germany had died; most of the scientists he had grown up with were solving the puzzles of another world. Saddened by the realization of the changes in his social life, still horrified at the final revelations of his African studies, he decided to go to New York and there place the results of these years of sacrifice in kindly hands before his death made it too late. He was not satisfied with the definite knowledge he had secured in Africa, for he realized that it would be useless unless he made it available to the betterment of the human race.

For when the final truth had dawned upon him it had made him afraid.

Fear is not necessarily an attribute of ignorance. The greater a man's knowledge the more intense may be his fear—not the blinding fear that shows in the panic of the submerged masses, but the keen, appreciative, intelligent, foreseeing fear of the scientist who combines that emotion with an intense desire to prevent a threatened calamity. And because of this intelligent fear, mankind has checked the Black Plague, reduced the incident of Yellow Fever, and made Smallpox no longer a scourge that could kill one out of every three of the population in less than a year.

Souderman knew that he could not die till he communicated this fear and the facts behind it to a few scientists who could appreciate the terror of it. The knowledge had to be the common property of a small group of men who would be willing to guard it—a terrific secret through the generations—till the time came for action. Then, and then only, could the antidote be used, the means of defense slowly perfected. And, perhaps unknown to the masses, once again human life on this globe would be saved through the sacrifice of many generations of "unsung and unwept" scientists.

The student of termites came to New York. He then visited Chicago and Philadelphia. His record, his knowledge, made him a welcomed guest in the homes of all those who worship at the feet of Minerva, the Goddess of Wisdom. The German scientist talked little, listened intently and observed much. Finally he found one man who had the peculiar mental qualities and the scientific foundation and vision necessary for an accurate appreciation of what Souderman had to tell him. This man had youth, enthusiasm and an excellent education. In addition he had a respect for the aged. The old man at times wished that the course of his life had made it possible for him to have a son like that. Subconsciously he adopted him.

Having finally found his man he spent a few months in becoming acquainted with him, in learning his mental reactions to the great events of life. He wanted to leave this man all the knowledge accumulated in those long years of African residence, but he did not want to make any mistakes. He had a secret to tell but in order to make that secret safe he had to know just how to tell it and in order to learn how to do this he had to study the personality of this youngster who was to become not only his pupil but finally his heir.

Adam Fry

IT is interesting to note that there were many men in America who were more brilliant than Adam Fry. There were scientists who had forgotten more than this young man knew. But Adam Fry had one trait that Souderman considered necessary for the complete understanding of his secret and that was imagination. That was a trait that many scientists lacked, in fact most students of the world felt that imagination had no part in their life work. Yet Souderman had developed his imagination and by means of it had come to at least a partial understanding of one of the world's

greatest secrets. And he felt that unless his heir possessed the same peculiar mental trait he would not listen to what might seem the ravings of an old man. He wanted a man with the combination of Galileo and the far-seeing vision of Jules Verne, a scientist who understood insect life as Fabre and Maeterlinck did and yet had the imagination of Wells, Poe or Gernsback. In Adam Fry he believed that he had one of these peculiarly combined personalities. At least he was sure that the young man would understand.

And that was why Souderman had been worried until the day he met Adam Fry. He wanted a scientist, a man given to imagination and at the same time a man who would understand the half truths, half dreams of an old man. He had lived so long an introverted, shut-in life among the termites that he was sensitive of criticism, could not stand disbelief and ridicule. He had come to America to find a man, and in a few days after meeting Adam Fry he knew that his search was ended.

The reactions of Adam Fry to the older man were all pleasant. In a singular way he had always been accustomed to respect age and the mere sight of this worn-out, shriveled, old man, who had spent a lifetime in isolation awoke an intense pity and even love in the young scientist. He felt that this man knew something, and to the youngster all knowledge was sacred. He desired nothing more than to learn what this white-haired man had to teach and regretted that his comparative poverty made it impossible for him to spend a few days or a week with him. With these thoughts it was a gratifying shock to learn that the old man had money, and was anxious to adopt him as a student for the rest of his life. All of Fry's financial worries could cease and he was to be paid an adequate salary, to do nothing but listen day after day to Souderman and from time to time write a complete statement of the conversation. This statement was to be put on pure linen paper, with indelible ink that would last for ages and two copies made, one for the Congressional Library in Washington and one for the Public Library in the City of New York. They were only to be accessible to members of the American Academy of Natural Sciences.

Adam Fry listened to the plan proposed by Souderman and at once resigned his position as a chemist in the Bug-Tox laboratory. The two men decided to rent a small apartment overlooking Riverside Drive, do their own housework and cooking and, with the exception of regular hours spent in necessary exercise in Central Park, to devote their entire time to the completion of this manuscript. Souderman did not feel that he was in the best of health. He did not fear death but he did dread the thought of dying before his life's work was securely placed on paper and burned into the mind of his pupil.

Hans Souderman was so impatient to begin his story that he could hardly wait till they were installed in their apartment. He had impressed on his adopted son, for so he was fond of considering him, the necessity of having a permanent ink. They also decided not to cover more ground each day than could be written twice before the beginning of the next day's talk. Adam Fry, trained as he was through years of scientific work to take notes, made a beautiful task of assembling and arranging in logical sequence the old man's conversation, which at times was rather rambling and disconnected. The completed manuscript can be examined by anyone who cares to take the trouble to do so, though it tells only a part of the complete and final story resulting from the work of years of patient toil completed by Souderman in Africa.

CHAPTER II

Souderman's Story

THE story as told the young man by Souderman during these daily conversations, arranged in some order and avoiding repetitions, was about as follows:

"In order for you to fully understand the end of my work, Adam, you will have to listen while I tell you something about the beginning of it. Perhaps you know something about it. If you do you are indeed an exceptional young man. I went to Africa many years ago to study the termites. Many people think that they are ants and their common name is the White Ant, but they are very different from the ant. It is not *Aymenopterous*, and therefore has no close relation to the ant and the bee. It is usually classified in the order of *orthoptera*, *orthopteroid neuroptera*, *neuroptera* or *pseudoneuroptera* of the division *Corrodentia*. Some consider it an entirely separate class and term them the *Isoptera*. There are probably from 1200 to 1500 distinct species but probably not more than three hundred had been identified and properly labelled. I have the honor of isolating more species than any other one man, but why not, when I have spent my life living with them?

"They are very old. One hundred and fifty species have been found in fossil amber. Go back a million years and there were the termites. Go back to the endless night of the Primary and there is the termite associated with the *Protoblattidae*. Some men have placed their beginning one hundred million years before man appeared on this globe. Surely a very respectable age.

"During all this time they have lived and through these countless ages they have adapted themselves to their surroundings and necessities. Otherwise they could not have survived. Man, supposed to be a most intelligent creature, has just begun to learn a few of the things that the white ant has been doing for millions of years. But they are able to live efficiently in many ways which we are ignorant of and yet, though the knowledge might be beneficial to us, so far we have been unable to learn the secrets of their lives and apply this knowledge to our own.

"Doomed to a existence in darkness, they have adjusted themselves to the life of the blind. With-

out defensive armour, weak, pitiful little things, they have perfected an architecture so secure, and build their houses of material so strong that they could not be broken into by any of their natural enemies, until man came with tools of steel and dynamite. Unable to secure a sufficient supply of natural food they adjusted themselves to a diet of cellulose (wood fibre). This they either use as spawning beds for a distinctive kind of mushroom, the *Volvaria Eurhiza* and the *Xylaria Nigripes*. These mushroom beds they cultivate carefully, preventing the growth of other unfavorable species. In other forms of termites large numbers of flagellated protozoa are found in their intestinal canal. The weight of these protozoa is often one half the total weight of the entire termite. The termite eats cellulose, and the protozoon digests it. In doing so it dies and itself forms food for the host. These protozoa, the *Trychonympha Campanula*, are found nowhere else in the world, only in the intestines of the termite.

"They build their homes of intestinal secretion mixed with small particles of sand or vegetable debris. This forms a wall that is hard and a perfect protection against their natural enemies. Their houses are perfectly ventilated and at the same time kept warm by some heating system, probably generated by decaying vegetable mould. While they need moisture they are enabled to live in tropical countries where the rain falls very seldom. Do they make water? Or conserve it? Who knows? At least they have all they need.

"Compared with their size the height of their buildings is enormous. Suppose man was to build according to the same scale? Then his houses would have to be 1800 feet high, something that so far has never been attempted by the race we are so proud of belonging to. In architecture they show the most astonishing variation, especially when you consider that all of the actual building is from the inside, out. Their houses have spires, domes, columns, façades; they imitate every known geometrical shape known to mankind, but they go beyond that and become so grotesque that it would seem that some mighty mind had fashioned them in and during an attack of *delirium tremens*.

"They not only build houses but they build tunnels. Destroyed by the light, unable to defend themselves in any way, they go enormous distances for food and always through tunnels of their own construction. At times enormous colonies are connected by tunnels apparently for no other reason than a desire to form a social contact with each other, perhaps some union, political and economic.

"They have solved the problem of food. Everything they touch can be eaten. They eat their dead, the useless members of their colony, they even eat repeatedly their own dejecta. Nothing is wasted, nothing is useless. In time of surplus they place little piles of food in corners. Certain workers have nothing to do but to supply food to other groups of their political organization.

"They continue their group life by hatching and caring for the eggs and young of the Queen. She is an enormous creature ten or fifteen times larger than her subjects. She simply lies in the royal cell and for a life of five years she lays one egg a second, thirty million a year or one hundred and fifty million in her lifetime. When she grows old she is eaten and replaced by a younger Queen.

"The eggs are fed different foods and consequently develop different kinds of termites. Some have thought that there are as many as fifteen different kinds carefully differentiated and shaped according to the work that they are called upon to perform. Some are workers, others inside policemen and still others soldiers. A few are specially fed to become future queens, others to be the husbands of queens. I want you to remember that these are all raised from the same kind of eggs and they are produced according to the need of the colony. If soldiers are needed then they are produced till the need is supplied.

"Do you see anything wonderful about that? Compare it with man, the so-called intelligent creature. What can he do? A man and a woman can produce a child. They can not even determine that child's sex. It will be some kind of a child but can they make a musician, an artist, a mathematician out of it? Can they determine its shape before it is born? The termite does all that and more too.

"It has successfully solved all the problems of life. The community it lives in is a dark, sad, and gloomy one but it is highly efficient. The individual is in every instance sacrificed for the group. It is Russia magnified and idealized a million times. But they have survived through the ages. For ten million years the Ant has been at war with the termite but the Termite still survives. It lives on, not as an individual but as a colony. Who directs it?

Souderman Goes to Work

"ON a single acre in Africa there may be twenty colonies. Each house seems to be separate and yet there seems to be an uniform rhythm of life. They do things in the same way and at the same time.

"Some naturalists have thought that this can be called instinct. That all the deeds of this wonderful little thing are without intelligence. Fabre said there is no reason in the wasp, no real mind in the bee, no intelligence in the ant, and yet the termite is far above these lesser creatures. I studied this matter. Was there an intelligence? If so, was it an individual or a group matter? Perhaps there was an electrical phenomona, something resembling the contact of our neurones and dendrones. I spent years searching for an answer. For a while I thought that the Queen headed the group but I learned that she was subject to the same immovable laws that governed all the rest. She was simply a highly specialized, glorified worker and, when her usefulness was over she was killed and eaten just like all the rest of the colony.

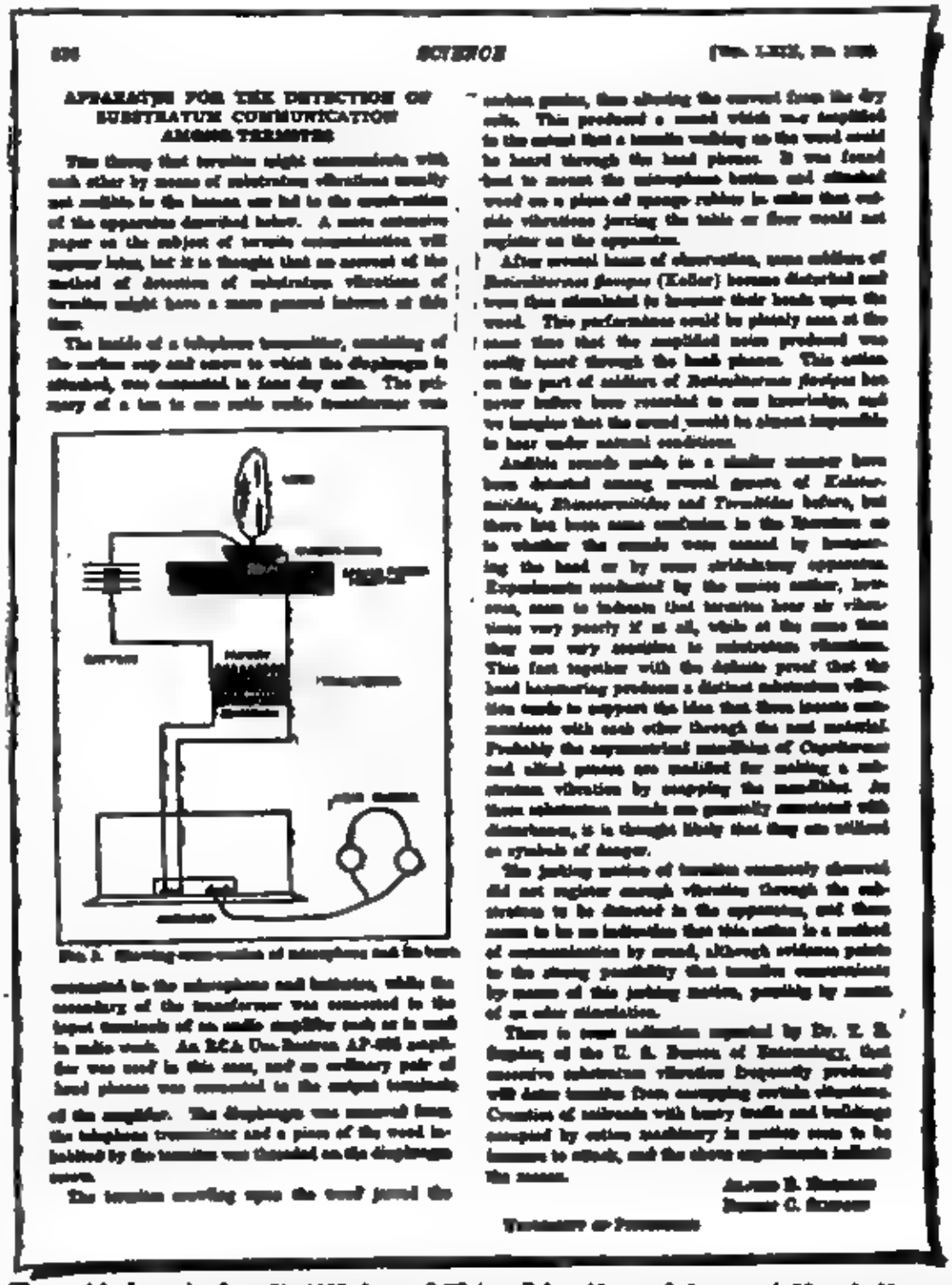
"There seemed to be some occult power, some

super-termite intellect directing the affairs of each house. I hunted for it and for years I could not find it. I tried to apply every known physical and metaphysical law to the problem and all that I attained was failure. Twenty years passed. During that time I had done nothing but live and think and study termites. I tried to become one of them. I felt that if I could only put myself in the place, say of the Queen, that I could understand the mental reactions of the unit, the house, the colony better. I got nowhere but to the depths of despair. I felt pitifully dumb, ignorant, helpless. I was on the outside, separated from the Great Truth, not so much by the colony wall but by sheer lack of intellect. These little termites, helpless, blind, small, were living a mental life so complicated that I, a great scientist, could not begin to understand it.

"Then I suddenly wondered about the noise. For there is a noise that comes from the colonies. Some think that it is music. Others call it cracklings, tic-tacs, whistles, cries of alarm. If the ear is placed on the wall of a termite colony these sounds are plainly heard. I had known of them for years. Now it came to me, like a stroke of lightning, that perhaps they could be interpreted.

"Up to the present time I confess that much of my work had been simply the observation of the average insect student. I had carefully duplicated the methods followed by other men, and had devised a few methods of my own but there was nothing very original. With my new desire, to interpret the sounds that came from the termitary came a new vision. Other men had tried to saw openings into these houses, to even blast them open with dynamite; as a reward they had only the partial satisfaction of seeing the inside of the termitary in a state of hopeless confusion; it gave them no real idea of the life that was being lived there under the usual circumstances. What should be done was to study the life without disturbing it, observe it through the unbroken wall. That was my ambition.

"Thanks to the new improvements in the science of the amplification of sound I was able to assemble a rather satisfactory apparatus. First there was a bell-shaped stethoscope, a little similar to the instrument used by physicians to examine the heart. It had a rim of soft rubber which had little holes in it. When this was pressed to the wall of a colony house it remained there by suction. Inside was a diaphragm. I had the sound augmented by radio tubes, and finally given to me by a loud speaker. Now all I had to do was to sit in my observation tent and listen to the sounds that were being formed in the termitary. Naturally the first instrument was not satisfactory. The little fellows promptly ate it. They are the most remarkable eaters that I have ever seen. They eat everything. In Australia they ate beds, carpets, foods of all kinds and even soap. It was thought that if the foods were put in tin cans they would be protected but they worked at the tin, literally corroded it with a juice they secrete and then ate the rusty metal and the food inside. They think nothing at all of eating



APPARATUS FOR THE DETECTION OF SUBSTRATUM COMMUNICATION AMONG TERMITES

The theory that termites might communicate with each other by means of substratum vibrations usually not audible to the human ear led to the construction of the apparatus described below. A more extensive paper on the subject of termite communication will appear later, but it is thought that an account of the method of detection of substratum vibrations of termites might have a more general interest at this time.

The inside of a telephone transmitter, consisting of the carbon cup and cover to which the diaphragm is attached, was connected to four dry cells. The primary of a ten to one ratio audio transformer was

Fig. 1. Showing construction of microphone and its connection to the microphone and battery, while the secondary of the transformer was connected to the input terminals of an audio amplifier such as is used in radio work. An RCA Uni-Receiver AP-408 amplifier was used in this case, and an ordinary pair of head phones was connected to the output terminals of the amplifier. The diaphragm was removed from the telephone transmitter and a piece of the wood infested by the termites was threaded on the diaphragm screw.

The termites working upon the wood joined the carbon grains, thus altering the current from the dry cells. This produced a sound which was amplified to the extent that a termite walking on the wood could be heard through the head phones. It was found best to mount the microphone button and attached wood on a piece of sponge rubber in order that outside vibrations jarring the table or floor would not register on the apparatus.

After several hours of observation, some soldiers of *Reticulitermes flavipes* (Kollar) became disturbed and were then stimulated to bounce their heads upon the wood. This performance could be plainly seen at the same time that the amplified noise produced was easily heard through the head phones. This action on the part of soldiers of *Reticulitermes flavipes* has never before been recorded to our knowledge, and we imagine that the sound would be almost impossible to hear under natural conditions.

Audible sounds made in a similar manner have been detected among several genera of *Kalotermitidæ*, *Rhinotermitidæ* and *Termitidæ* before, but there has been some confusion in the literature as to whether the sounds were caused by bumping the head or by some stridulatory apparatus. Experiments conducted by the senior author, however, seem to indicate that termites hear air vibrations very poorly if at all, while at the same time they are very sensitive to substratum vibrations. This fact together with the definite proof that the head hammering produces a distinct substratum vibration tends to support the idea that these insects communicate with each other through the soil material. Probably the supernumerical mandibles of *Capritermes* and allied genera are modified for making a substratum vibration by snapping the mandibles. As these substratum sounds are generally associated with disturbances, it is thought likely that they are utilized as symbols of danger.

The jerking motion of termites commonly observed did not register enough vibration through the substratum to be detected in the apparatus, and there seems to be no indication that this action is a method of communication by sound, although evidence points to the strong possibility that termites communicate by means of this jerking motion, possibly by means of an odor stimulation.

There is some indication reported by Dr. T. E. Snyder of the U. S. Bureau of Entomology, that excessive substratum vibration frequently produced will deter termites from occupying certain situations. Creation of sidewalls with heavy trucks and buildings occupied by noisy machinery in modern cities is by instances to attack, and the above experiments indicate the reason.

Alfred B. Sheppard
Homer C. Stevens

Tennessee Experiment

This article from the June 21, 1929, issue of "Science" is evidence of the remarkable coincidences of the thoughts of widely separated people. Both Dr. Keller and the author of this article began working on this problem at about the same time. It illustrates also that the work of Dr. Keller is already showing its prophetic insight as it is engaging the attention of serious scientific workers.

through lead of any thickness. They can finally go through a glass wall. Naturally they made short work of my first *acoustophone*, but I fooled them. I made a study of the cement they used in building, was able to make a fairly good imitation and covered all the apparatus with that. I guess they thought it was a part of their colony house; at least they did not try to eat it.

"Now followed long days of study. I realized that my life was not long enough to do all the research, especially when it came to the interpretation of a new language, so I enlisted help. The poor fellow was a wonderful linguist but he just hated bugs of all kinds so I made hundreds of phonograph records for him and let him study them in comfort in his house at Cape Town. It was odd. I did not even tell him what they were records of; just told him that it was a new language and that I would like to see if we could isolate it, and obtain some meaning as to what it was all about. The conclusions he reached after two years were astonishing and were very useful to me in reaching my final conclusions.

"Working independently of him, I was able to isolate certain sounds but as I had no idea what actions were accompanying those sounds I at once saw the need of actually seeing what those little fellows were doing. That made me undertake a special study of the physics of light rays. I left Africa and went to France, and a Frenchman and I made a little machine that would enable me to look right through the wall of the colony house. It had some of the principles of the X-Ray but was far easier handled and a great deal more satisfactory. Its penetrating power was only three feet but that was better than nothing. Now I could look into different parts of the colony house. I could see the life lived there under normal conditions. And it was my hope that as I saw that life lived and heard it lived that I could obtain some harmony of purpose between action and sound.

Soudernan's Questions

"I FELT that at last I would be able to tell whether these termites were able to think. Some of their actions pointed to intellectual processes. Of course Fabre did not think so, but I felt that some of my observations would have made him change his opinion. Of course instinct may become very complicated, but is it not possible that the human intelligence is after all simply composed of millions of complicated, automatic, instinctive acts?

"We learned the language of the termite. At least we thought that we did. You remember that I said that the philologist in Cape Town simply knew it was a language but did not know that it was a language of ants. The poor fellow went wild over it. He said that he believed it was the oldest language in the world and the parent tongue of all human speech. He isolated root words, established derivations, and finally wrote a glossary composed of over five hundred words. That was what I wanted. I made a few hundred more records for him, promised that I would finance his book when he was ready to publish it and then went back to my own work, determined to learn and use this new language as soon as possible.

"I experimented for at least two years. For example, I took a very sharp auger and bored a hole one inch wide through the wall of the house that I had my *acoustophone* attached to. Now I was able to look into that house and hear into that house and note their reaction to this opening of a hole. As usual a number of soldiers came out and formed a solid ring around the sides of the hole. Then workers came, each either dropping a globule of liquid cement or a small piece of sand. Within an hour the opening was closed. Were these orders given? Did some supreme mentality realize the danger and close the opening by giving orders? I procured an ice machine and literally froze, or tried to freeze a small portion of the wall. I had a thermometer in the wall but there was no result. The termites simply rushed large masses of fermenting mould to that spot and in spite of my efforts they kept the temperature to a point where they could live. Was that intelligence or instinct?

"I would bore you with a detailed study of all these experiments. At last I came to some very definite conclusions. Each termite had some nervous system. They were able to understand certain sounds, and originate certain sounds. These sounds were used in a way to resemble speech; at least they served as a means of communication. But there was no sociability, and the conversation seemed to consist mainly of orders. Some power issued orders and the millions of occupants of one termitary said 'Yes, Sir,' and at once obeyed.

"Then I was faced with a new problem. Whence came these orders? What constituted the initiating force? Here was a plunge into the realm of the unknown, a leap into the darkness of the Great Void. For listen to me, and pay attention, Adam Fry, to this next statement. These colonies are thousands of years old. Perhaps one house is a million years old. How can we tell? They are enormous things. Earthquakes cannot destroy them, or tornadoes break them to pieces. Cattle wander at will over them and on their tops enormous trees grow, for it is a peculiar fact that they hold all vegetation growing on their colony houses as a thing sacred and not to be eaten.

"Listen to me. Man since the day of Magellan has sailed and walked and flown around the world. They have gone up in the air and down into the deep seas. The North Pole has been looked at and the South Pole will soon be a commonplace. Where has man not been? Everywhere? No! There is one place that the foot of man has never been, one place the eye of man has never seen, and that is the real inside of a terminary. What is there? How deep do they extend into the ground? What we see may be only an outer shell. These are the questions I asked myself. I knew that they were old. Was the intelligence governing them old? The life of the human being is but a trifle compared

to the race history of the termite. I felt that in all these million and hundreds of millions of years that they had attained to mental processes that we could only imagine.

"So far I had seen only the carrying out of orders. The termites seemed to be but servants. Where was the greater mind? Was there a mind? If so, how old was it? Was it superior to my mind? *Could we communicate?* By this time I knew the five hundred words. I had isolated sentences, in fact I was beginning to talk their language. For example they had certain sounds to indicate that a hole was broken in the wall and that it must be repaired. I reproduced that series of sound, that termite sentence on a phonograph and then transmitted it by vibration through the wall. I watched the result through my visual apparatus. At once the soldiers came to guard the opening; instantly the workers came with their liquid cement. Of course there was no hole to repair and there was a resulting confusion. I waited a day and repeated the experiment. Once again there was confusion. On the third day there was no reaction. Attaching my *acoustophone,* I carefully bored a hole in this same colony house. At once there was an order given but it was not the same as I gave. Some new sounds had been introduced. The soldiers and workers obeyed at once and closed the hole. Here was a novelty. Someone had learned that their orders were being duplicated, and consequently their orders from the inside were changed, and the workers instructed to pay no attention to the old form! I went to another termitary and gave the original order. There was no response. Then I gave the new order and for two days it was obeyed but on the third day it provoked no reaction. Do you see anything odd in that? It seemed to me that the supreme intelligence in the first termitary had communicated the news of the complication to the supreme intelligence in the second colony house. I went one mile away and the result was the same, a hundred miles and there was no difference.

CHAPTER III

The Great Discovery

"SO I worked a game of chess with this thing that ruled the colony house. I would live with the receivers of the *acoustophone* in my ears, and by a specially ingenious invention I learned to talk to the termitary with such a changed voice that it was an exact duplication of the tone used by the insects. And gradually it dawned upon me that there were two languages being used. One for the issuing of orders and the other—dare I say it?—for the communication of the Supreme Intelligences of the various colony houses.

"When that idea dawned upon me I went rushing down to Cape Town. I was growing old, and there was no time to spend in isolated working.

"To my surprise Johanson in Cape Town had arrived at the same conclusion I had, namely that there were two languages. He had been so stupified at the idea that he felt it almost impossible to put it into words but when I blurted out the same thought to him his tongue was loosened and for over an hour he spoke as though touched with the Divine Fire. We talked over the matter for a day and here is our conclusion.

"The termitary has two languages. One is very simple and is used only for the giving of orders. The other is vastly more complicated, only imperfectly understood by the soldiers and workers and apparently used as a means of communication between the Intelligences of different colony houses. Johanson hated insects. He just naturally could not stand the thought of an ant crawling over him, but he came with me to my termite colonies and I will give him the credit for staying there two weeks. Then he left me. The work we accomplished during those two weeks placed me on the threshold of the Great Discovery.

"I ceased to worry about the lesser language. In fact I found that the vibratory scale of the two languages was so different that I could tune in the greater language and tune out the lesser one. On the day I started to do this I was nearly 68 years old. And the thought came to me, irresistible, tremendous, awe-inspiring, that the words I was hearing were being uttered—or produced by an intellect that was perhaps a million, perhaps ten million years old. And I was trying to understand it! I, a nothing, a mere speck of time-unity of 68 years was trying to understand and analyze and study something that was perhaps alive when my ancestors were crawling reptiles or something less. But I had the Urge. I could not eat. I was unable to sleep. Nothing would satisfy me but the knowledge of the Ultimate.

"And when I was 70 I heard them talk and understood them. Do you see what that meant to me? For two years there had been no experimental work; I had attempted nothing new; I had simply sat there in a chair or rested on my cot with the receivers in my ears. I learned the language.

"And then the Great Idea came to me.

"This termitary with the millions of termites, all carefully differentiated in shape and ability to perform the various forms of work required for the successful functioning of the Colony was not composed of millions of individuals but was simply *one large animal.* The Colony House was the skeleton, changed according to the growth of the animal and its needs.

"Think this over well. One large animal. Does it mean anything? Think of an animal a million years old, ten million years old. Imagine the wisdom that it would have accumulated! And these little things we called termites, they were just so many cells in the body of this animal. With the conception of this fact I realized that I was faced with the wisest, most remarkable life that had ever appeared, or would ever appear on this globe. All the forms of life that had been coincident with it

had disappeared, unable to withstand the changing conditions of earthly existence but the Giant Termite had survived. The Palaeozoic types were all gone. The pterodactyl, mammoth, cave bear, saber-toothed tiger had all failed to adjust themselves. But this animal I was thinking of had slowly conquered continents and was threatening Europe and Northern America. And I was studying it! Alone, unarmed, incompetent, I had the temerity to place my intellect above that of a million years.

"Other lives were gone but they lived on. They had met with a cunning patience changes in moisture, temperature, sources of food. In every instance their intelligence had been sufficient to provide security against a threatening danger. In all the studies made by over fifty careful observers only *one termitary* was found lifeless. Thus there was no death rate. *They lived on and I believed that their ambition was to finally rule the world.*

"That gave me food for thought. I knew that the area they lived on was slowly expanding. Now and then new cities, fresh agricultural areas were over-run. Was there a method back of this? Could they plot, prepare and premeditate an attack? Each one was hopeless in its stationary position. It could not move, but it could form new members. Across the field it would send a cement tunnel and through this blind tunnel the workers would go perhaps for a hundred feet and there a new Colony House would be erected. I saw that happen. For two years I saw such a house grow, and during all those two years it was ruled by the Intelligence from the first house; and then—Oh! You must believe me, for this is one of the greatest of proofs, the tunnels were broken, the two houses became separate and in the second house was a second Intelligence, and it was not a new form but had the wisdom and apparent endless age of the first. Was it a part?

"I determined that what I had seen was simply a budding, a cleavage, a peculiar form of birth of a new individual. And thus, by slowly establishing new individuals, all with the same mentality they hoped to conquer the world.

An Amazing Conversation

"I REMAINED silent. As I said, for over two years I did nothing but listen. And finally I could stand it no longer. Their plans were so heartless, so coldly diabolical, maddening in their cleverness and deadly in their ability to wait for a thousand, a million years, if only at the end of that time they were able to rule the world and drive out all other forms of life, it was all so horrible that I just had to do something.

"You will remember that I had never tried to talk to them. But now I determined to do so. I formulated a phrase in their language and I vibrated that phrase through the walls of a hundred Colony Houses in the immediate neighborhood of my laboratory. I said,

"This is a large world. There is room for all. Why try to destroy all other life?"

And then I went back to my favorite termitary, replaced the *acoustophone* and started to listen. And what I heard was this. I wrote it on a piece of paper and put it in my wallet. It was fortunate that I did so. Here is the paper and here is the message.

"For a long while we have been studying you. Because of this we have tolerated you. Now you must leave. We can tolerate no interference with our plans."

"For years I had been unmolested by the termites. Here was the explanation. To complete their knowledge they had to study man. In order to do this they had to have a man near them. They could not catch a man and make him a source of observation. For all these years I had obliged them by remaining in one place. I thought that I was studying them, whereas the truth was they had been studying me. For once in my life I was absolutely at a loss as to my future conduct. Restless I went to bed. The next morning, after a bad night of dreams I woke to find my laboratory a wreck. Everything was gone, eaten, cut to little pieces. My records, apparatus, food supplies, were gone. My clothing was eaten; but I had been spared, though the cot I slept on, even the mattress was a complete wreck. They had told me to leave, and this was the final warning. I had the clothes on my back, some memos in my wallet, and that was all.

"Of course the very valuable phonograph records were safe in Cape Town. At least I thought so. I hurried there, but I was too late. Poor Johanson had been attacked the same night, only he had been killed, literally eaten alive by millions of warrior termites, while his records, in fact his entire house was a wreck. I was horrified and at the same time I knew that my life might be the next to go. Here was time for deceit. I arranged to leave Cape Town on a certain steamer. I told dozens of people that I was going to do so. I even went out to a colony of Termitaries and shouted the news and then at the last minute I left in an airplane. That ship sank the day after it sailed from Cape Town and all on board were lost. Divers examined the hull and found that it was literally eaten to pieces by termites.

"Looks as though they tried to get me. I do not think they can in New York City. It is too cold; but they are working on the problem of living in cold climates. They have to solve that and then they will creep over the world. So there is my story and there is the danger. Johanson could corroborate it but he is dead. Our records are destroyed. Only my intellect survives and I am now an old man. Well, Adam Fry, cease writing, and tell me if you believe it?"

The young man smiled,

"Certainly I believe it. Why not? At one time I studied medicine. The anatomy of the human body is proof that you are right. For days I have

been listening to you describe those colony houses and all the time I have been thinking, making use of my imagination, trying to compare your termite organization with the human body. You have made the comparison one worth while. You told me when we first met that what you wanted was a man with imagination, a young man that could think outside the beaten track. Well, I will reward your search and I will make a statement. *The only difference between the Termitary and Man is one of age and intelligence.*"

Souderman laughed, almost hysterically, as he grabbed his student and kissed him on either cheek.

"My dear boy, my real son., You see it. You see it! You saw the analogy all by yourself. I wanted to have you do that. For nights I have been praying that you do this. I did not want to tell you for that would spoil it all. Only by arriving at this conclusion separately could you show me that you were worthy to share my secret. Now I can die happy for I know that you will go on, and on. With the foundation I have laid you will be able to build a superstructure that will astonish and perhaps save the human race from a future terrible destruction. I believe you are right. I believe with you that there is an universal pattern of life of which the combined life of a single termite colony is the oldest and most remarkable form. It must have been the oldest form and all the other life on the earth since its development must have been foolish efforts to imitate that type of life. With what success or failure you can judge. We think man has been the great achievement of the ages. To the ability of the Great Termite we have added locomotion. What else? Nothing. Does the Giant Termite know anything man is ignorant of? My boy, when I think of his intelligence and our ignorance I have to laugh at the colossal asses we are making of ourselves.

"For years I studied the termite. I was thrilled at my discoveries and at the fact that my apparatus was untouched and then I suddenly found out that I was the one they were studying and when they were through with me they destroyed my work, they killed poor Johanson, and in their efforts to get me they wrecked a large steamer. They are simply waiting. Time with them means nothing. And when they have learned the little things they need they will come North; and when they do all other life will vanish. They are self-sufficient, and need no allies. For millions of years the real ant has been fighting them, but what is the result? Not in a single instance has the black ant been successful.

Souderman's Warning

"I TALKED about a single pattern of life. We are a form of termite colony only we are infinitely lower than the Giant Termite of the Tropics. We live sixty, seventy years and then we are dead. I wonder if the real Termite knows what group death is. We prate of our nervous system, our red and our white corpuscles, our muscle, bone and digestive cells, but are they under the control of our wills? Not at all, and yet in the case of the Giant Termite every function is absolutely governed by the Central Intelligence. It is true that when our outer wall, our skin is broken it is repaired by our workers, but what a poor process that repair is in comparison with the repair of the wall of the termite colony house.

"Everything we do is child-like, puerile, infantile compared to their profound efficiency. If we knew what they knew we would be able to prolong life indefinitely, become efficient in any line of endeavor. Our problems of life, nutrition, housing, disease, the temperature of the body, all these things would be simplified. We call ourselves human beings, in reality we are simply a collection of a number of inter-related but at the same time independent cells living within a colony wall called the skin, and so far we know absolutely nothing concerning the real governing of these cells by means of the higher intelligence, mind, or what-can-you-call-it of the central nervous system.

"The Central Intelligence of the Giant Termite issues direct orders to all the individual cells which form his body. Consider them as cells, or as individual living creatures, little termites, whatever you please, but no matter how you call them they are absolutely under the control of the Central Monarch, the IT of that colony. Can we do that? If our liver cells are sick, can we make thousands of new ones? If there are too many white corpuscles, the policemen of our blood, can we order that one third of them be destroyed and eaten for the public good? Can we form new human beings? You say 'yes' but will they automatically be possessed with the accumulated power and wisdom of the past hundred million years? How about the idiot, the epileptic, the defective we procreate? There is none of that in the Giant Termite.

"Man knows a lot but when he comes in conflict with these stationary animals who have serenely wandered down from the past aeons he has to surrender. He cannot live with them, or, in fact, near them. They strike in the dark but when they finish there is no place for the man form of termite. Some day they will come. We will be blindly going to the movies, amusing ourselves talking through the air, listening to the radio, dashing over the roads in our automobiles aimlessly like so many cockroaches, or flying in the air like blundering beetles. We will die as a race before we are able to appreciate what has killed us. Perhaps for some centuries a few of the human beings will survive shivering around the poles. I see it all and you will too because you have imagination but who else will see it? Can the race be warned?"

"They cannot!" replied Adam Fry. "They will almost kill themselves laughing at us if we try to warn them. Tornadoes they understand, death from war and tidal waves, destruction from famine and pestilence they have at least read of, but that whole nations should perish through the silent

working of a creature that they would only see as a small, helpless, defenseless, blind white ant, they will not understand. They are too grandiose, too sure of their position in the world they live in, too confident that they are selected by God to rule the world. They are even confident of God."

"But the race must be saved," insisted Souderman. "We are men. It is incomprehensible that our brothers should be so stupid, but we must save them in spite of their asinine lack of imagination. I say that we must save them. In reality you must because I will not be here much longer. You have the secret. In the little time I have to live I will teach you all I know and then as you grow older you must teach some one else. Perhaps when the real test comes, when there is the final struggle, the one man who is our descendant might save mankind."

"That is some measure of responsibility."

"I know, but it has to be assumed."

"I feel," said Adam Fry, slowly, as though he was not sure of his statement, "that the first thing we should do is to preserve your knowledge of the language of the Giant Termite. I do not mean the command language spoken to the warriors and laborers but rather the language used by the Central Intelligences when they were talking with each other. You surely know it by heart, at least you have enough of it so you could make phonographic records, or perhaps better still, teach it to a few philologists so they could make a written language out of it. Then there is another idea which can be developed in the course of the next few years. I feel that your work was cut short, and that it is incomplete without an effort made to actually find, and see one of these things, whatever you might call it, which is the head, the actual intellectual force behind the animal you call the Giant Termite. I feel that something might be learned if one was actually captured. If its knowledge was so superior to ours perhaps some compromise might be reached. How about it?"

"Your first idea is a good one," replied the old scientist. "Work once done need not be repeated. Many years of my life was spent in the endeavor to learn this peculiar language. If some one repeated that work it would be simply time wasted. It will be an easy matter for me to make phonograph records and I could also teach it to you. Perhaps we can enlist the aid of a real linguist who will work out a grammar and a vocabulary. We will think about it. In regard to your second suggestion, it opens interesting possibilities. Of course you realize that I left Africa the way I did because I felt that some one should know the secret and I was convinced that the Giant Termites were going to do all they could to stop me.

"They killed Johanson. Of course some would call that a coincidence but I feel that it was the tremendous effort of a gigantic intellect to preserve secrecy. I have tried to imagine what such a thing looked like but I have failed. Perhaps one could be located and captured, but it looks impossible to me. Of course we could drill into a termitary and blast it with dynamite, and thus we might get to the bottom of the animal but it might be that this would only result in its death. Perhaps they are psychic and when we found everything we would have to confess that we have actually found nothing. It might be like the thing we call a soul.

"We think that there is a soul but in the autopsy room, on the dissecting table where is there a trace of it? I have thought of a gray mass, round, with convolutions, shaped like the brain of man, but what would it be like without its body? Could it live on? Naturally we could not capture an entire colony and transplant it. No, someone who knows more than I do will have to undertake the problem of determining what the actual Central Intelligence of the Giant Termite really is. I know the danger of it, the shrewd, vast intelligence of it, the ability it has to bide its time and adjust itself to changes of its externals. But I cannot even guess what it looks like or how it can ever be conquered."

CHAPTER IV

The First Invasion

"WELL, there is nothing like trying," said Adam Fry bluntly. "Nothing can be accomplished without the primary effort. Suppose we get the language put into an imperishable form and then some years from now I may go to Africa myself. I want you to make a map of that region for me. I want to go there and locate that special Giant Termite you talked to, the one that threatened you if you did not leave them alone, the one who said he had been studying you. Perhaps I could catch him."

All that spring the two men worked and on into the summer. Phonographic records were made, maps were drawn, detailed blue prints showing the various scientific instruments used by Souderman in his years of African study. As soon as Adam Fry was able to sustain his share of the conversation the two men talked in the termite language, first perfecting themselves in the language of the workers, which Souderman called the "Command" language and then advancing to the speech of the Giant Intellect used only in intercommunication between the Egos of the different colonies. The young man worked harder than he had ever done before in his entire adult life. Gradually the two manuscripts neared completion, and finally they were finished. The one was sent by express to the Congressional Library at Washington, while the other was in a drawer, waiting to be carried to the New York City Library. The men had decided to take this valuable document in person to the Librarian and explain to him the importance of it. They had decided to do this the first of August.

It was an interesting sight to see the two men on that morning. The one, old, stooped-shouldered and white-haired and yet with the gleam of youth in his eye; the younger man, keenly alert, physically capable of any exertion, brilliantly equipped in

every way to play the part in life that fell to his lot. They wore red neckties this morning and were freshly shaved. Souderman even insisted on carrying a cane. He cried that a man was as old as he feels. They ate a hearty breakfast of soft boiled eggs, bacon, toast and coffee. Then they prepared to start out.

But when they opened the drawer the book was gone.

It was a manuscript book, the pages and soft leather cover held together by steel rings. These steel rings were in the drawer. The two men looked at each other. At last Souderman said, with a deep sigh.

"The summer has been hot."

Then he pulled the drawer wide open and pointed to a long tube the size of a straw and about the same color that stretched from one corner of the drawer over to the middle, where the book had been.

"Termites," he whispered.

Adam Fry looked at him as though a thousand questions darted from his eyes. But all his tongue could say was,

"A coincidence?"

The old man smilingly shook his head,

"We might fool ourselves by thinking so, my lad, but with the Giant Termites nothing happens by accident, by coincidence. No! This is simply the first attack of the enemy. It might not have happened in the winter but they have taken advantage of the long and very hot summer. How did they locate us? You cannot think? Where is your imagination? I am sure that they did not look me up in the telephone directory. But now is not the time for morbid introspection and idle speculation. Now is the time for action. Here is the thread of life, the channel through which the attack was made. Suppose we try to follow it downward. They probably came up through the leg of the table. I recall now that it has not been moved since we came here."

"Suppose we tilt it over on its side. There! See that hole in the bottom of that leg? Now where did it connect with the floor? Just as I thought. There is the hole. Now, somewhere in the ground under this building is the main body of the Giant Termite that was assigned to this work. Can you imagine the cunning, the intellect, the enormous mentality of such a being? Immobile, not capable of changing his home, he yet devised methods to be carried to New York by ship, locate himself in the city, find us here, satisfy himself that I am the man he has been seeking. Then he established stations for observation in our rooms.

"No doubt every word we said, all of our plans, perhaps, for all I know, even our thoughts were understood, appreciated, and stored in the storehouse of memory. We think that we were shrewd in placing one copy in the Congressional Library. Perhaps even now a Giant Termite is waiting there to destroy it when it comes. Well, boy, our partnership is over; from now on, our only safety lies in separation and rapidly moving from place to place. Fortunately we duplicated the phonograph records. We will each take half of them. I am going to secure a skilled linguist and go to some cold country, like Labrador and teach him the termite language. You do what you think best, but be careful of yourself because one night will ruin your hopes."

"Do you still think that they want to kill us? They had a thousand chances."

"I do not know. They never tried to hurt me so long as they thought I was not going to fight them. Just as soon as they considered me an enemy they came close to destroying my life."

Adam Fry sighed.

"I do not want to leave New York yet. I have an idea that I want to work out. Then I will be satisfied to go to Africa and see what I can do there. I tried to imagine all you told me but these later developments show me something that before seemed only visionary and fantastic. I feel that you are more than right. All these Giant Termites need is some sure defense against the cold and they will overrun the world. They may not kill mankind but it is possible that we may be reduced to abject slavery, a life of raising cellulose and mixing cement for our Masters. Are you going to try and find this individual Termite that is living somewhere under this building?"

"No," replied Souderman, vigorously shaking his head, "the best thing to do is to pack our things and get out. Suppose we spend three hours tracing this slender hollow tube of cement to the basement. By the time we return we might find the entire surface of every phonograph record smeared with a glass-like cement, and utterly ruined. We had better leave. I said out loud that I was going to Labrador and you said out loud that you would stay in the city. We had both better change our plans and think them instead of saying them. Perhaps they are able to read our thoughts. Perhaps not. But you have ample funds, and all I know you do. You go ahead. The safety of the human race lies in your hands."

Finding the Man

WITHOUT the loss of any more time the two men packed the most valuable of their possessions and left the small apartment that had been their home for so many interesting months of companionship. It was not till they were several miles away from the apartment house that they ventured to speak. They went into a small cafeteria that was humming with the noise of a thousand busy customers. Buying some rolls and coffee they sat down. Then Souderman took out a paper and pencil and wrote an address on the paper.

"I will be here if you want me," he whispered, and handed the paper over to Adam Fry. The young man looked at it a long time memorizing it, then burned it and placed the ashes in his coffee.

"Fine," he commented. "There could be no better place. I will let you know from time to time how

things are going. Good-bye, my dear Master and take care of yourself."

And so they parted.

The young man took his heavy bundle of records and went to a cold storage plant that made a specialty of taking care of furs and other perishable valuables. He left the phonographic records of the Giant Termite language there and walked out on the street. To all appearances he looked just like any one of ten thousand men he passed every few minutes. There was this difference. He knew what danger menaced them and he cared; they neither knew nor cared. He was on his way to save them. He went to a cheap hotel and registered for 24 hours. Once in his room he simply sat and thought. He had the beginnings of an idea and he wanted to find some one who would have sufficient mentality to take that thought and push it over into actuality. Even as Souderman had hunted for a man with imagination so was Fry searching for a supermind, an intellect that would be able to think in channels hitherto unknown to mankind. The young man felt keenly that the saving of the human race was the responsibility of Souderman and himself, but he wanted to enlarge the partnership. He felt keenly the need of a brain better trained than his in what? Perhaps in sociology, religion, world politics. He hardly knew what kind of a brain, the manner of a man that he really wanted but he did know that he could not rest till he had found the man and told him the story of the Giant Termites and the additional thought that he had which so far he could not form. So far he had to be content with the simple knowledge that the germ of the thought existed.

Fry reviewed the men that he had known, the great men in the world who were really doing work of vast importance. There were scientists, economists, business men, politicians, world visionaries, lawyers, physicians, psychologists and leaders of religious thought. Wherever he located in his mind a man of sufficient intellect he saw the man so engrossed with work that it seemed impossible to require of him the taking of one additional burden. Rich men, poor men, industrious men, giant intellects doing the work of a dozen average men, the labor of a million morons. Where among such men could he find a man who would willingly listen to a perfect stranger? He saw that none of them would willingly listen to him but perhaps he could force one to for at least a few hours, till interest made it impossible for the listener to break the thread of the narrative. With this new viewpoint he again went over the list of the men he knew or had heard of and finally selected a bank president.

Here was a peculiar choice. Bailey Bankerville was the descendant of the famous Bankerville who had largely financed the American Revolution. No one knew just how long the family had been financiers. Perhaps they originally came from the Vank de Ville family and everyone knows that they were the financial power behind William the Conqueror when he conducted the campaign that conquered isolated England. Bailey, or B.B. 4th as he was known to his intimate friends, had become the head of the family on the early death of his father. He had handled the affairs of the enormous corporation with the greatest ease by finding capable men to do the work for him. Consequently he had found a sufficient time to play and he had done so.

His play would be considered by other men as work. For example he spent a large sum and a year of his life making a careful study of the monoliths of Easter Island. When he finished this he was easily the world's best authority on these enormous remains of a people long since dead and forgotten. His book on the subject, printed in a limited edition of twenty volumes, is one of the most prized works sought by anthropologists. With nothing but stones to work with he formed a theory of the life and habits of these people that no one has ever been able to controvert.

This work, which he laughingly called play, was but one of a number of similar adventures in which he sought to wrest from Mother Earth her secrets. He had been so busy doing this and at the same time augmenting the family fortune that he had no time to play in fields feminine. So far he knew woman simply as the female of the Genus Homo. He was fairly well familiar with her attributes as an entity but never willingly sought the company of any woman except his mother and sisters.

This was the man that Adam Fry picked out to finish the thinking of his great thought. Fry knew the man had imagination, boundless perseverance and an education that equipped him to at least follow the bare outline of any scientific discussion. The problem of the man being solved the next question was how to meet him. That became far more serious than appeared at first thought.

Making Him Listen

BAILEY BANKERVILLE was artistic and therefore temperamental. To a great extent he was a man of moods, quick to react to little, peculiar stimulations. When Fry sent in his card and asked for an interview the banker was annoyed. He had eaten salt mackerel that morning and it was repeating in a very gastronomical way. He saw the name "FRY", and he asked his private secretary.

"Is he small or large?"

When the man answered that the visitor was a trifle small he at once reacted with the phrase, "A small fry—a poor fish—if I see him once I will never be able to get rid of him. He will be a repeater like that damned mackerel. Tell him I am busy. Tell him I am out! Tell him I refuse to see him. Tell him anything you like but show him the door."

Adam Fry came back the next day—and the next. And never again, at least not to the banker's office.

The following Saturday night the banker had a very uncomfortable dream in which there seemed to be an inability to move. Waking he found that this was an actuality for he was securely tied to the bed and also gagged to prevent his call-

ing for help. In the dim light he saw a man at the foot of the bed and now that this man saw he was awake he started to talk.

"I am Adam Fry. I wanted to see you; in fact I had to see you. I called at the office three times and you would not have anything to do with me so I was forced to visit you at your home. I am not a robber or a murderer; my motive is neither commercial nor religious. I feel that if you will listen to me talk for an hour you will listen to me to the end. I hope that I can take the gag off and unbind you. Will you agree not to call for help?"

The banker had a saving sense of humor. For a week he had been making fun of this man without ever seeing him. Now the man had him.

"Sure I will listen to you," he said as the gag was untied. "Let me free and we will go to the library and spend the rest of the night. I think you are a bothersome interloper but anyone that is clever enough to pull this stunt is worthy of consideration. I suppose you are some new kind of bond salesman, one of those go-getter devils. Let me turn on the light and locate my bathrobe and slippers and for goodness sake put that gun away. It might go off and break something like a looking glass. Hard luck, you know, to have a looking glass break."

In a few minutes they were in the library comfortably seated in over-stuffed leather chairs. Bankerville offered a drink which Fry refused, saying, "You will think that I am drunk anyway before we are through."

Then Adam Fry started to talk to the banker. He first told all about the Giant Termites as studied by Souderman. He was still telling about them when the butler entered the room to open the shades and let in the sunlight. Bankerville jumped up with a start.

"Let's shave and dress. We can talk while we are shaving. Then we will have breakfast. I will send word to the bank that I will not be there today. I never had so much mental sport since Tige was a pup. I do not know where you have been staying but I know where you are going to stay from now on. You are going to be my guest. I do not know how much you have to tell me but you are going to tell it all before you quit. Send for those records. They must be kept safe and I am going to send the best linguists I can hire to examine them and learn that language. You either are insane or you are up against the largest problem that ever hit mankind since the flood. You high-jacked me into this and by the Sacred Cow of Benares I am going to stay in as one of the leading actors till the play is finished."

"That is what I wanted you to do," answered Adam Fry.

He was greatly pleased. In fact he felt that now he could begin fighting in earnest. At the same time he realized that, even though the rich man was thrilled with the story of the Giant Termites there was still a large question, and a very important one, to be answered.

Would the man's brain leap over the gap that had stopped the mental processes of Adam Fry. There was a secret there somewhere. Fry felt it, could see dimly the outline of a great truth but the final development was still an impossibility. It needed something better than a Fry brain. Would a Bankerville intelligence suffice?

The two men shaved and prepared for breakfast.

At that time a rather startling surprise awaited Adam Fry. Bankerville had a sister, and that young lady, Susanne Bankerville, was very much in attendance on the two men. In any household news spreads like wildfire and the banker's sister, greatly pleased at the idea of anyone actually hog-tying her brother and forcing him to listen to a wild-goose yarn, had violated all feminine rules and was at the breakfast table, charmingly clad and apparently anxious to make toast for the two men.

Up to this time Bankerville and his sister had been sufficient unto themselves. Clad in masculine attire she had accompanied him on all of his queer expeditions and the fact that she had obtained an excellent scientific education made her a very valuable aid to Bankerville in his anthropological researches. She did not look very masculine this particular morning and that was entirely her own, premeditated fault. She had lived with her brother for thirty years, he being five years older than she. During that time she had never known of any man getting the best of her brother in any kind of a conflict. Now the whole household was buzzing with suppressed curiosity and it was no wonder that she made herself very charmingly feminine and waited with considerable desire the appearance of the dragon killer.

Adam Fry was at a loss to know how to consider her after the introduction. Could he talk freely or must he be guarded in all he said? Bankerville lost no time placing him at his ease, as he followed up the introduction with a long tirade concerning the real worth of his sister and at the same time what a tremendous nuisance she always was when they visited the far-off places of the earth.

"This young lady," he began, "refuses to let me get out of town without her. Ever since she started to walk she has been a tagger. She ran away from school to go to the Easter Islands with me. We never did find her till we were three hundred miles from shore. She would not have shown up then were it not for the fact that she became seasick. Well, that is the way it has been. When I am in New York she behaves mighty decent but just as soon as I get the wander-lust she insists on getting out her knickers and though I try mighty hard I cannot shake her from my trail. This is the first time in five years that she has had breakfast with me. Why? Because she smells a rat. She thinks that I am into something and she refuses to be left out. I do not know how she came to find out that I invited you to breakfast so we could discuss the new classification of shell-fish but women are peculiar that way. She thinks that you are a Boy Scout or something and she wanted to meet you. She looks real cute now, but you ought to see her

in her war togs. You can say anything you want to in her presence; she is absolutely to be trusted. And I will say this; her brain is better than mine for she has feminine intuition."

That was the end of his speech. Susanne Bankerville smiled, "And now, Mr. Fry, tell me about the shell-fish."

"Giant Termites, my dear sister," corrected the brother.

"Do you know anything about Termites, Miss Bankerville?" asked Fry.

"I certainly do not, but do not mind me. You start right in where you left off last night, or was it this morning, or have you just begun? The information I have is so confusing. Brother says he asked you to have breakfast with him and others say that your conversation started during the night."

"Well, let our guest eat and then we will all go to the library. I have sent for those records and when they come I will play them on the Orthophonic. I know sister will like to hear them. She is wild about all those foreign jabbers."

The rest of the meal was very quiet and almost formal. The young lady soon showed that she was the perfect hostess and Adam Fry was at once placed in a position where he had to acknowledge that he was having a very pleasant time.

CHAPTER V

Fry Delivers A Lecture

SOON after they were again seated in the library but at this, and for that matter at all future sessions, Susanne Bankerville was an interested member of the audience.

"There is no doubt," continued Adam Fry, "that the millions of little blind termites enclosed in a colony house simply compose so many parts of one animal, which Souderman called for convenience the Giant Termite. I feel that for a correct understanding of our problem we must consider the colony as an outer shell or skeleton. The various workers, warriors, even the Queen and her husband are all dispensable and replaceable but irrespective of the death-rate of the individual termite the Giant Termite lives on as he is always absolutely able to replace any of his dead individuals.

"I feel, and that is what I told Souderman, to his great delight, that all life follows the same primitive pattern. First there was one cell and then a number of cells united for offensive and defensive reasons. Then the cells specialized. The analogy between the Giant Termite and all other life is interesting, but perhaps especially so in man. The human body is composed of a large number of individual cells. They serve many different purposes and like the individual termite can only do one kind of work. The termite works industriously at its task, which was predetermined before it was matured. It can do nothing else. The corpuscle in the blood stream is similar, the red cell carries oxygen; under no circumstance can it do anything else. The white cell is a scavenger, it cleans up the debris, but never can it carry oxygen. The nerve cells carry messages but the muscle cells contract.

"All these millions of cells are contained in a skin just as the millions of termites are contained inside the stone wall of the colony house. The great advantage that the Giant Termite has over the human termite is the fact that it can send out its cells from the body proper and be sure that they will return. When our cells leave the confines of the skin, they are lost. That is what happens when there is a hemorrhage. The individual cells go, but they never return. They are absolutely lost. When we compare the control the Central Intelligence of the Giant Termite has over its individual cells, to the control that the Central Intelligence of man has over his cells we are forced to acknowledge our pitiful inadequacy. What takes place within us does so without our knowledge, control or approval. How different in the Giant Termite. Occasionally our cells revolt, die without being replaced, new cells grow in a disproportionate manner and we die of cancer. At the best we live but a few years and then we die, while the Giant Termite lives on. I doubt if it knows death.

"The Giant Termite is what it is today because for millions of years it has been made to fight enemies of life, of atmosphere, of bitter surroundings. It had to endure hunger, privation, danger and yet survive. In the short time man has lived what has he learned? Practically nothing."

"Just one minute," interrupted Susanne Bankerville. "Do I understand that each individual termite has a separate intelligence?"

"They must have. I compare them to cells and yet the microscope shows that they are really formed of many cells. They have the ability to understand speech, because they obey orders. They have a definite speech with words, and yet they have no initiative. All they can do is obey. Communism, social discipline is carried to such a point that every one of them has to be finally sacrificed to the good of the community. They work for the Central Intelligence but have no part in any happiness or benefits. The entire social order is predicated on self-sacrifice of the individual in order that the mass, the entire animal might live."

"Another question. Do you think that the cells within our bodies have a similar individuality, a peculiar type of mentality? Do they know anything? Can the blood cell, the little bone cell, the muscle fiber think, reason, do anything but obey a nervous impulse?"

Adam Fry looked at the girl curiously, as he replied "Honestly, I do not know. Certainly there is not the beautiful control of our cells that the Central Intelligence of the Giant Termite exercises over his individual termite cells. We cannot force our cells to perform certain acts. Of course we can, in a limited way, as in walking, but the efforts we make to manage the affairs of our body are pitifully infantile. We cannot even keep alive, or well."

"Yet every part of the work done by the Giant Termite is duplicated in our bodies?"

"Practically. But poorly. It is as though we were just learning; as though, after a million years we were just out of our infancy, barely beginning to understand life. We are learning to talk but we lisp, stutter, utter thoughts in baby talk. Nothing like that with the Giant Termite."

"How much do they know, anyway?" growled Bankerville.

"How can I tell? Souderman worked with them for years and he was completely nonplussed at the end. He even accused them jokingly of finding our apartment in New York by making use of a telephone directory. Perhaps they have all the wisdom of the entire preceding ages. Perhaps they know a hundred times more than we do. They certainly have perfected a bodily structure that is infinitely more remarkable than ours. They have, by Jove, what an idea! They have put legs on their corpuscles, taught them to walk instead of swim and then took away their blood liquid. Their cells literally run around in dry arteries, juiceless capillaries and yet are able to perform all the necessary work. The human female has an ovary, bilateral. If all the conditions are right she may be able to reproduce herself, but in doing so she is subject to a thousand adverse conditions. The Giant Termite reproduces at will any of its cells and when it is ready divides its Central Intelligence, whatever that may be, and forms a new individual."

"And I suppose your idea is that all life is like the Termite, only not so highly organized?"

"Something like that. It seems that perhaps the dog, the fish, bird, human being are all simples forms of the termite colony."

Susanne Understands

FOR a while all three were silent. An oppressive silence seemed to hover like a mist over them. The sun, which had been shining through the library windows was now covered by the fog that arose from the smoke-tortured city. For all his accustomed poise Bailey Bankerville started in to tremble. It seemed that he was tortured by the effort to think. The sweat started to break out on his forehead.

"Dammit! Oh! Dammit! I am trying to think of something and it eludes me. Something about us and the Giant Termite and I cannot get it out. Can you help me, Adam Fry?"

"I cannot. I have had the same feeling for a week. That is why I came to you. There is something there that I ought to see but for the life of me I am unable to. I feel it. It just comes so far up to the threshold of consciousness and then it sinks back without crossing. I have been unable to sleep because of it. I thought you, with your vaster experience in the mysteries of the world could fathom it."

And then Susanne Bankerville jumped up and began to dance around the room like a twirling dervish. And as she twirled she sang,

"I have it! I have it!! Oh! I HAVE IT!!!"

And she started to laugh hysterically. Then she threw herself into her brother's lap and sobbed.

The rich man looked over her shoulder towards Adam Fry.

"Don't mind her," he said softly. "She gets this way sometimes. I suppose that you would call it psychic or something. Usually its very well worth while—what she says when she is able to say."

Finally the sister sat up, and wiped her face, as she said.

"Silly and all that but the idea was too big for me. But it is what you men were hunting for. I just know it is. You said, Mr. Fry, that all life had a certain pattern and the pattern and the oldest and most perfect pattern was the Giant Termite. You said he was formed of millions of little white ants and then you said that each little termite was formed of little cells. In making your comparison with man you said he was on a par with the Giant Termite but you gave him too much credit. He is simply on the level physiologically and psychically with the little termite. He has no initiative, no spontaneous ability to control his actions. I cannot explain it but I believe that all the people in the United States are simply little termites, the cities are large colony houses. The cities are connected with roads, rails, even air routes, but over all the millions of inhabitants is a Central Intelligence that governs and directs. No, He cannot be God—not as I understand God. There is a Central Intelligence for each nation—Mexico—France—Turkey—Germany—Russia. And the people of each nation are just like those poor little blind termites that sacrifice everything for the good of the nation. I do not believe that the Central Intelligence of the human's National Animals is as clever, as intelligent as the Central Power of the Giant Termite. They are not so old and they do so many silly things. Russia is trying to put into force some of the habits of the termitary. They call it communism. Now that is my idea."

The two men looked at each other in silence.

Finally the rich man said,

"Not a very pleasant thought, Adam Fry, to feel that one and all of us human beings are just running around doing what we are told to do by a Central Intelligence that is not God and that has not even the brains of a Giant Termite."

"Not pleasing, but it sounds as though it was true. I feel that this is the thought I have been looking for. The world has to be saved from those white ants. Meantime, the human race, poorly governed, badly directed, expends their strength fighting among each other while all the time the termite terror becomes more real."

The brother turned almost fiercely on his sister,

"What do you mean, Susanne, by a Central Intelligence governing the United States, and another one governing Mexico? Do you mean the political power, the combined thought and determined purpose of the people, the will of the mass

to rule, a combined psychic impulse jointly held by the entire nation?"

"Nothing of the kind!" was the determined reply. "if life has one pattern and the Giant Termite is the pattern, then everything you say is nonsense. Mr. Fry says that Souderman proved positively that the little termites were hopeless and helpless and all they had to do and all they could do was to obey the orders of the supreme intellect, I think he called it the Central Intelligence. They do just what he or it says. The Queen lays so many eggs and when he says 'Enough' they kill and eat her. The eggs are developed into so many workers, so many outside warriors, so many internal policemen, so many nymphs according to his orders. If food has to be secured, the colony defended, a new termitary formed, then he orders and they obey. If they are too many he commands that a certain percent be eaten. Not in a single instance, as far as I can learn from your talk, and from what I've heard of Maeterlinck's book, is there the least suggestion that at any time they are capable of independent thinking or action. In the scale of life, in this uniform pattern of existence we men and women correspond to the little, helpless, blind, insignificant termites, and if this is true then we have nothing whatever to do with our government. We may think that we have—but that is just delusional ideation if you will allow my phraseology. No doubt our President is selected rather like the Queen termite is. When the Central Intelligence is through with him he is thrown out of the White House and killed, as Wilson was."

"Well. Let's go on with the argument. This is growing interesting. We are all little termites and have nothing to do with our lives or actions. All is controlled by a Higher Central Intelligence. Is it God?"

"No."

"Less than God?"

"Of course. Far less than even the Central Intelligence of one little colony in South Africa."

"Where is it?"

"I will answer that," said Fry suddenly interrupting. "One of the things that Souderman failed to do was to actually see the ruler of a termitary. Mark you, he talked to one. He was convinced that there was one. He was sure that they were able to talk to each other and that there was perfect accord and a communicated harmony between them; but he never saw one. He says that no man has ever seen the inside of a colony house. That is he means entirely. He did not know how deep they extended into the earth. But down there somewhere in the termitary was this Central Controlling force. I have the blue prints of all of his instruments; the study he made of the two languages, one the command tongue and the other used for the intercommunication of the rulers, is preserved for us on phonographic records. Souderman actually talked to the THING, and IT talked back. Now if all life has the same pattern and we could actually see this THING that rules a colony house, then we might be able to at least imagine that something like that ruled the separate Human Termite nations. These things that rule us may be powerful but I fancy that to a great extent they are stupid."

Laying Plans

BANKERVILLE threw his sister off his lap and started to walk the floor. Suddenly he exclaimed,

"Perhaps we are all wrong. Surely if the three of us are just little helpless termites of humanity we are doing a lot of criticism of our Central Intelligence. We are doing a lot of independent thinking. Perhaps sister is mistaken."

"That is a logical statement," answered Fry. "But you must remember that the animal of which we are a part is still in a very experimental stage. I do not think that conversation, dreams, and criticisms such as we have been indulging in would be possible between three little white ants. They have had all such independent initiative crushed out of them by millions of years of communistic life. Their motto is, "*One for All.*" The *all for one* disappeared from their lives many centuries ago. I feel that our seeming independence is simply a proof that the animal that we are a part of is in a very early stage of its intellectual development, and we all know that man was nearly the last animal to appear on the earth. We are pleased to say he is the greatest and most highly developed while in reality he is probably the weakest of all the earth patterns just as the Giant Termite is the strongest.

"Nevertheless, since we have the thought that we are supreme we can at least play the game bravely. We may be governed by the Supreme Force, I think Schopenhauer called it the 'WILL.' Claude Bernard spoke of a 'Morphological Plan,' another philosopher called it the 'Causeless-Cause of all Causes.' I do not care what you call it. I, personally, am in favor of fighting the battle out to the end. We may get the worst of it. If we could look into the future we might recognize even now the hopelessness of the struggle but as it is, why not fight? Three of us, all loyal to each other and consecrated to the betterment of our fellows. Then there is Souderman, brave old man, fleeing to a cold country so his knowledge can be preserved. He can be counted as number four."

"That sounds good to me," said Bankerville, "It has been a long time since I have had a vacation. Time to start something. The more danger there is in it the better pleased I will be. Any suggestions as to our line of attack?"

"I think that we ought to try and solve the question of just what the Central Intelligence of the Giant Termite really is. That will help us in our effort to understand and influence the same motive or governing force in the human National Termite,

if our idea that there is such a force is correct. I believe that an expedition to Africa at the present time is sure to be a dangerous one, but that is the only way to start it. I have the exact location of the Giant Termite that ordered Souderman to leave the country. That is the one to go after. We will duplicate Souderman's machinery for listening and conveying sound and then, after we have learned the higher language, we will talk to this THING and if we escape alive we may have secured sufficient knowledge to communicate with the Central Intellectual Power of this nation and see if we cannot drive some common sense into his thick skull. Miss Bankerville, you have been of the greatest help to us, but you must not go to Africa. You have no idea of the danger. If a man like Souderman is thoroughly alarmed over the situation it is certainly no place for a woman like you to be."

The girl, but no, she was every bit a woman now, and a fighting one, walked over to Adam Fry and took hold of his shoulder, as she said,

"What do you think I am, Mr. Fry? Here I have been fretting my life away in the city for over a year, and now, at the first chance I have had for real sport, you say it is too dangerous. You and brother need me. Did you know that I can speak seven foreign languages? Do you realize that I have a *flair* for languages, a real appreciation of sound? I have to go with you, don't I, brother? He has never gone alone, have you, brother. You would be cruel to force me to stay. Now it's all settled and I am sure you feel better knowing that I have decided to give up New York society for your company. Let's start on those records. I am thrilled with the idea of actually listening to a termite talk, especially a Giant Termite that is millions of years old."

Bailey Bankerville threw up his hands in well-simulated hopelessness.

"You see how it is, Fry. This girl has bossed me ever since she was a walky-talky baby. I guess the only way to get rid of her is to take her with us. I am going to send for your clothes and you will be our guest till we start. I think I will send a long message to the Librarian of the Congressional Library warning him to carefully protect that manuscript. It would be a good idea for him to make a few hundred photostatic copies and distribute them throughout the world. I am going to send for some manufacturers of scientific apparatus and start them to work on those *acoustophones* that Souderman used in listening to the conversation of the termites. I think that it will be a good idea to hire a few expert philologists and one or two entomologists. We need a first-class staff of scientific workers, at least to start with. I feel that the closer we keep our secret the better for us, because I do not think it will help any to broadcast our intentions. Hells bells!! If those white ants can read a telephone directory they may be able to read the newspapers."

CHAPTER VI

Going to Work

WITH a man of Bankerville's training to think was to act. He converted several rooms of his house into a workshop and installed over a dozen scientists, all of whom were famous in their particular line. The phonograph records were reproduced and several sets sent out to strategic points in the northern part of the world. Work was started on the scientific apparatus that was necessary. An improvement was at once made in the X-ray sight machine and instead of a few feet of vision obtained by Souderman, over ten feet were now possible. Fry, Bankerville and Susanne worked at fever heat. It seemed as though time were a valuable jewel, not to be wasted in any way. Not until the third evening was there any relaxation and then, for some unaccountable feminine whim, Miss Bankerville dragged the unsuspecting Adam Fry to the roof garden of the Bankerville mansion. It was a beautiful evening, a lovely location and a supremely attractive woman. Adam was really not to blame if he tried in any way to duplicate the conduct of his namesake of the Garden. However such a procedure was far from his thought. For the time being he could think, talk and dream of nothing but the termite.

The woman realized this. At the same time she was a woman.

"Those termites seem almost devoid of emotion, Mr. Fry."

"They certainly are. Of course they may have thoughts that are unknown to us but mainly their life is a cold, cruel, materialistic one."

"Then there is no love as we know it?"

"I doubt it. The entomologist, K. Escherich, was fortunate enough to open a royal apartment and observe it for a few minutes before the alarm was given. He drew a picture of that apartment and its inhabitants which I have been seeing in my sleep; it haunts me like a nightmare. Souderman had a copy of it and we used to study it. He felt that it was very true to life. He saw the Queen, a large, inert, white creature, a feminine God, created for one purpose only, the laying of an egg every second. In a large ring around the outer sides of the room a solid ring of enormous warriors are constantly on guard. A ceaseless line of workers deposit drops of food into the mouth of their motionless sovereign. Other workers seize each egg as it drops, wash it and carry it away to the nurseries. Around the Queen small policemen guard her from any possible attack. For five years she lays an egg a second. Then her usefulness over she is deprived of food, dies of starvation and is, like all other dead termites, eaten."

Susanne shuddered,

"I am glad that I am not a Termite Queen. Has she a husband?"

"Yes, a poor little, insignificant thing. He is only a small fraction of her size and spends most of

his time hiding underneath her to avoid being eaten by the workers. It is thought that he fertilizes her eggs after she voids them."

Susanne shuddered again. This gesture drew her closer to Adam Fry.

"I am glad," she said, "that you are not a termite male."

And Adam Fry replied that he was glad that they were just human beings, able to look up to the stars and smell the flowers and know what the love of life really was.

After a month of hard work the scientific expedition was ready to start to Africa. A special steamer had been chartered and loaded with everything necessary to promote success. There were two airplanes and the same number of competent pilots. Laboratory workers, entomologists, linguists and one expert in poisons that might be applicable to the termites if danger presented. Probably few expeditions had been so thoroughly equipped in such a short time. It was still summer time and the plans provided for a start on the first of August.

A Strange Attack

IT was the last of July. The boat was all ready. It was the last night the three conspirators were to spend in the Bankerville mansion. The talk that night was not about termites but of the social changes that would take place in the world if the controlling Force of the nation could be discovered, and influenced for the good of the common people. About ten P. M. several terrific explosions were heard and the entire house was rocked on its foundations.

"Earthquake?" asked Fry.

"Earthquake nothing. That was some kind of dynamite or T.N.T. Hellsbells. Hear those shouts. Sounds like a mob. That is a queer thing. First time I knew anyone had it in for me. We will investigate this later on. The thing to do now is to get out and do it quick. Let's slip out through the garden and back to the car and beat it to the boat. I smell smoke—perhaps they are trying to set fire to the house. Here, Fry, take a gun, and you, Susanne, take this pair of automatics. Thank goodness you know how to use them. Now let's beat it."

And in the darkness that just preceded the flare that told of the burning of the house they rushed to the automobile and down to the ship.

Once on board the ship Bankerville started to telephone to the various members of the expedition to join him at once. All night he stayed at the phone, giving a thousand orders, and not once did he make any remark about the attack on the house. Before daylight all were on board and orders were given to start down the bay. It was not till the ship was several hundred miles out from New York that he seemed to notice the other members of the party. They, unable to help him in his complete absorption of the various problems arising from the sudden leaving, had spent part of the night listening to the news that was coming over the *Radio Sun* of New York. Newspapers were still in existence but many millions of urbanites received all the news of the day over radio newspapers and a part of the equipment of the ship consisted of a radio and television news service.

The three, Bailey Bankerville, his sister Susanne and Adam Fry gathered in Bankerville's cabin before breakfast.

"What happened last night, Sister?" he asked.

"Enough. An unorganized mob for some reason attacked our house. Some members of that mob had dynamite. They blew up part of the house, set fire to all of it, plundered what they could and badly handled all the servants. Three of our people were killed, including James, the butler. The police were at once notified but by some mistake went to the wrong part of the city. By the time they were on the job the damage was done. The fire department came out but the mob cut the hose lines. There was a terrific riot. It was the belief of the reporters that the three of us were buried under the ruins of the house. Apparently our quick getaway fooled them. There the police are at a loss to understand the reason back of the attack. Several of the rioters were arrested but could give no explanation for their conduct. They simply said that for some reason they had to do it, they saw a crowd running and they ran along. The editorial comment is rather peculiar. There is a good deal of talk about the rich oppressing the poor and the possibility of Communism spreading throughout the United States. It appears that there is a suspicion that the fire department and the police were in sympathy with the rioters; at least their handling of the entire matter was very inefficient. The Police Commissioner is going to make a special investigation. He states that for some reason there were hundreds of traffic violations at that time of the night, at least ten times more than normal and his men were so busy trying to get things fixed on the streets that he could not handle the riot as well as he might have on other evenings, and of course that in itself is peculiar. The President has come out in a guarded statement saying that there has been a great deal of criticism of the government by certain classes of the financial aristocrats and that whenever that happens the lower classes feel privileged to do as they please. It all looks like a mess to me, Bailey."

"What do you think about it, Adam Fry?" asked the banker.

"Well, of course I do not know much about the way the common people feel concerning you and your wealth, but the suddenness with which this happened, the dazed condition of the prisoners, their inability to understand what it is all about, the coincident traffic difficulty, the fact that the police went to the wrong part of the city, the cutting of the fire hose and even the statement of the President all seem to me to point to one thing."

"And what is it that you men think?" demanded Susanne.

The two men looked at each other.

"I guess we think the same, don't we?" finally asked the banker.

"Have to. What else can we think?"

"Well go ahead and say it," said the sister rather peevishly.

"Oh! It's simply this," finally said Fry. "The Central Intelligence of this United States, the Ego or whatever you call it that we talked about when we compared the life of a nation to the life of a Giant Termite—well, that Central Power, wherever and whatever it is, grew tired of our independence and original thinking and criticism of his stupidity and inefficiency and He ordered a lot of workers to go and destroy us."

Losing Themselves

"THAT is just what I think," said Bankerville, emphatically. "Of course I would not have thought that some months ago, but it really is a beautiful demonstration of our hypothesis. No doubt many of those people from the President down thought they were acting on their own initiative whereas in reality they were just obeying orders like the workers or soldiers in a Termitary. For some reason we were able to think a trifle faster than the Central Power. Of course if he had known we were in that automobile or here on the boat all night he could easily have gone ahead with the killing. He is capable of a good many things but he is not omnipotent by any means. The three of us are perhaps insulated in some way against his power. We irritate him but he cannot get rid of us. Perhaps he feels about us like a human being feels about a beginning cancer. Now the question arises as to what his next move is going to be. Will he think that we are dead, under the burning building? Or will he be able to locate us on the ship. If he can, perhaps he can command the crew to mutiny and kill us here. He can easily find out where we are heading for, as the ship's clearance was for Cape Town. What do you think we had better do, Susanne?"

"I believe we had better get lost."

"What do you mean?"

"Can you depend on the crew to be loyal?"

"I believe so. Most of them have been with me before."

"Then send a wireless out to the effect that the ship, under orders, left New York last night but that the three leaders of the expedition are missing and it is believed that they were killed in the riot. A few hours later send an S.O.S. that the ship is sinking. Then send another that the situation is hopeless and the crew has taken to boats. Then put the crew to work painting a new name on the ship and changing her generally. Slip into some little South American port and bribe the port authorities to give you false clearance papers and just go out on the seven seas as a tramp steamer. No use going to Cape Town, for there are all kinds of reasons that they will be waiting for us there, not only the Giant Termites but the representatives of the Central Human Termite Power. No doubt the English and American Powers are in sympathy."

"Well, they would control Australia."

"Certainly, but we would not go to any port, and even if we did we would not be recognized in our new disguise. Macterlinck says that at Cape York, Australia, large groups of termitaries can be seen from shipboard. We have had an exciting twenty-four hours but we must not lose sight of the fact that the main reason for this expedition is to find just what the real ruler of the Giant Termite really is like. We decided that we had to know that in order to come to any understanding of the same force in the national termite. Let's go on and do what we started out to do."

"Your entire plan sounds like common sense, Susanne," said her brother. "Do you know, Fry, that this little woman is right just about all the time?"

"I wonder why that is?" asked Fry.

"That is because I am a woman," replied Susanne. "You know we are right because we use intuition instead of reason in arriving at our decisions."

During the next two weeks Susanne's progamme was carried out to the letter. Gold bribed a Central American Port official. Dirty linens, unshaved faces completely changed the appearances of the officers and crew. All entered into the spirit of the game and it was hard to tell Bankerville from the most villainous seaman. Susanne, as the cabin boy, made a thoroughly hard-boiled lad. Several times they were stopped by American and English war ships but in every case their general looks and false papers were sufficient to fool the inspecting officers. Whenever this happened Fry and Bankerville would look at each other silently while Susanne, in her cabin would execute a real horn pipe.

"Hot, diggity, dog!!" she would exclaim. "Guess the little girl knew her onions. They are certainly after us but so far we have them fooled."

Bankerville Gives Orders

THUS they finally came to Australia. It took another week of careful sailing to locate Cape York. Several miles out they were forced to anchor but the termite colonies could easily be seen through glasses. There were hundreds of them rising many feet in the air in every possible shape. After their long trip the crew looked at the peculiar coast line with a great deal of interest. It was dusk and Bankerville gave orders that under no circumstances should any one leave the ship for any purpose. Then he called a meeting of Susanne, Adam Fry and the Captain. As they gathered in his cabin he almost shouted,

"Well, we are here now. The voyage is over."

Then he started to write on a piece of paper signalling to the three that they should watch him, and this is what he wrote.

"I believe that our destination is known to the various powers that are determined to destroy us. The only way that we can escape from them is to think faster than they do. I am sure that they can hear the vibration of the voice over great distances and that is how they came near killing us in New York City. I want them to think that we are here and going to stay. In reality we are going to wait till dark and then slip out to sea. To the east of us are the New Hebrides. There are thirty islands in this group but only twenty of them are inhabited, as the termites are so bad on some of the smaller

ones that the inhabitants have despaired of growing anything. One of these uninhabited islands is called Whitsunday and that is where we are going. Do you understand?"

The three silently nodded.

Bankerville silently held the paper in his hand, struck a match and burned all he had written. Three hours later the tramp steamer raised anchor and slowly steamed eastward. Four days later it found a pleasant and safe harbor on the east side of Whitsunday Island. It was over seven weeks since they had left New York. During the voyage their destination had been changed three times. Now they hoped that in this safe harbor of an isolated, uninhabited country, they could start in their study of the Giant Termite and the occult power that ruled it. The harbor was so small and yet so deep and landlocked that it was decided to keep on living on the steamer and make regular visits to the termitaries which even from the ship, were plainly visible, some being eighteen and twenty feet high. Some apparatus was sent ashore but as most of it was portable it was thought advisable to carry it back and forth each day.

That night Bankerville for the first time had a staff meeting of all the scientists. These gentlemen had not been at all idle on the trip but had spent long hours of study, some at the extensive library on the termite, others learning the language from the phonograph records, while the poison expert dabbled in his laboratory concocting new and deadly liquids and gases to use if necessary. As usual Bankerville ruled this meeting. He was a natural ruler and while he always consulted Fry and his sister, still, when there was a public meeting of any kind he allowed no doubt as to who was in command of the expedition.

"Gentlemen," he said. "I suppose you all are aware of the real purpose of this expedition. We are here to make a complete and thorough study of the Giant Termite. Some of us have peculiar ideas of just where this study will lead us, but irrespective of those views I would urge all of you to be true to your scientific education. If your observations fail to show that Souderman was right in some of his ideas I want you to say so.

"For example, you may arrive at the conclusion that what Souderman thought was a language is simply a coincidental conglomeration of natural sounds proceeding from the termitary and not in anyway connected with mental processes of any kind or form of life. You must remember that Souderman led an isolated, anti-social life for many years. He thought of nothing, saw nothing, heard nothing except it was in some way connected with the termite. Under these circumstances it is entirely possible that he may have had hallucinations. He made double records but the Giant Termite talking back to him may have been nothing but the other side of his dual personality. In other words he may have had the split nature, the true *Schizophrenia* of the *paranoid praecox*. In all of your scientific study of the termite remember these things. If one of you make a discovery do not accept it as the truth but see if three or four of your fellows are able to arrive at the same conclusion independently of each other.

"I want you also to always bear in mind that we feel there is a possibility that we are here dealing with a personality that is very old and very intelligent. It may be that the things we call the brains of the Giant Termite are far more intelligent than we are. They had no trouble in killing Johanson in Africa to keep him from spreading the facts about their dual language. They traced Souderman to New York and ate his manuscripts. Be on your guard. Because they are so small, always out of sight, do not underestimate their power. Because you never saw a thing happen do not think that it cannot happen. They are cunning. They have been known to eat a picture, frame and all, and at the same time cement the glass to the wall to keep it from falling and waking the people in the room.

"With such insects the only safe way is to remain constantly alert. There is no telling what they will do next. As the old copy book said, 'Eternal Vigilance is the price of safety!'

"I feel that we should finish this work as soon as possible but we do not want to finish it before we are through. By that I mean that we do not want to be forced to leave. The least relaxation of caution, the slightest break on our part may be the means of driving us from our work on this island. I want each of you to make as much progress in his speciality as possible but at the same time I want all your work to bear on one problem. Has the Giant Termite a Central Force or Intelligence? If it has, is this something like the mind of man, simply a higher form of a central nervous system or is it some occult power? Whatever it is, is it above or below the mentality of the human being? Can this Central Force be understood, apprehended by the senses of man by sight, hearing, touch, or is it something in a new dimension, that might be thought of but would not be tangible like objects in the three sensual dimensions. This is the problem that has brought Mr. Fry and me to this island, and we want to stay here till we have a satisfactory answer to at least a part of the question.

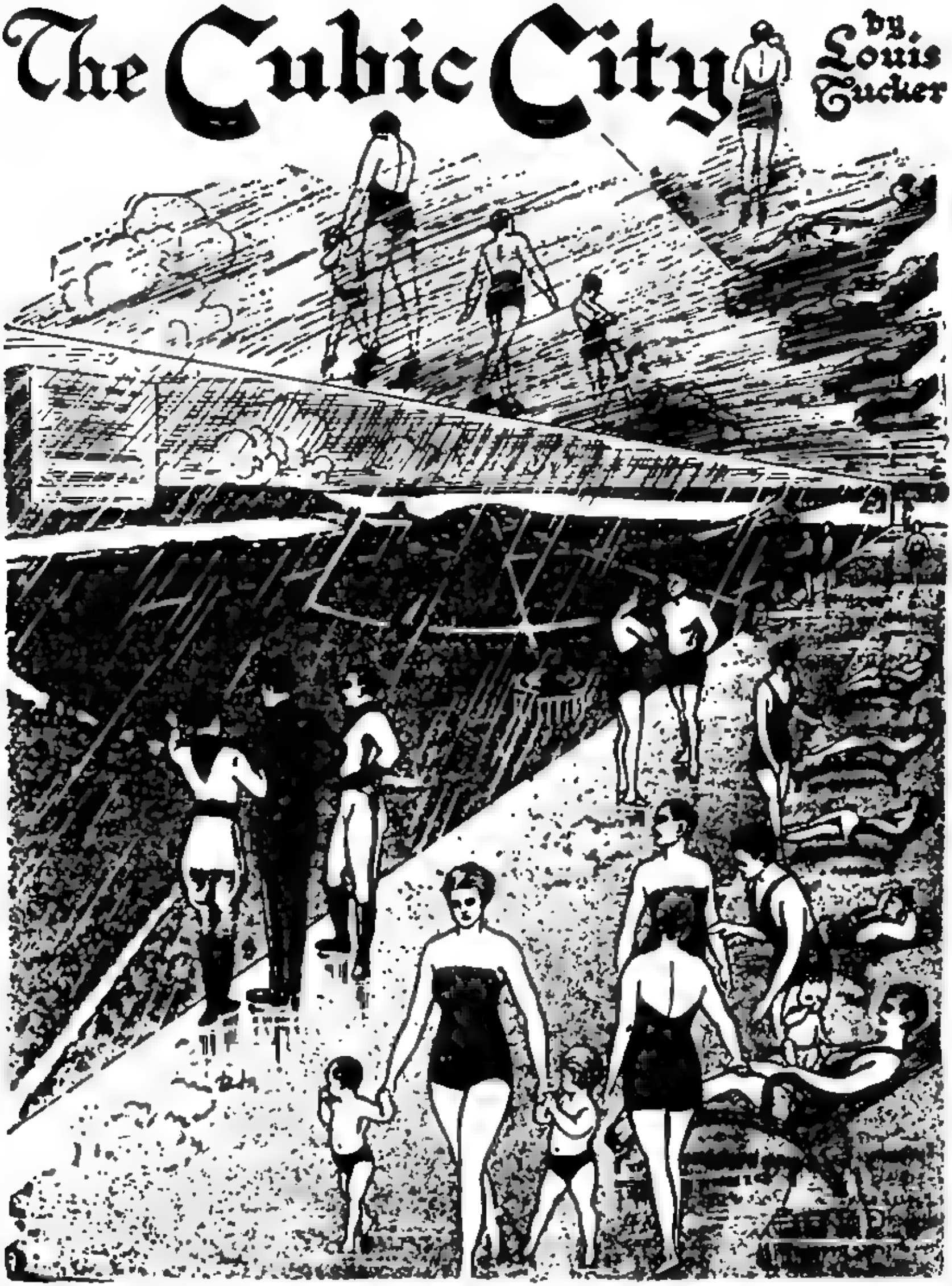
"Finally I want you to recall that we are dodging the influence of some peculiar occult power that has threatened us since that fateful night in New York. So far I think that we have been able to keep one move ahead of that power but at any time these influences may find us. I am going to ask you to be very careful of your own feelings. If you become angry, mad at one of your fellow men, report the matter at once to either Mr. Fry or myself. It may be that your desire to harm your fellowman is a desire that is put into you by this occult power. There may be even mutiny. Please think of this. Remember that our success has a large influence on the future hopes of mankind."

The next day they started to work.

(To be continued)

The Cubic City

by Louis Tucker



It was an esplanade two miles long. We were facing southwest a mile high and the view was magnificent. We were above the southern end of Central Park but New York City was gone; Manhattan was a well-kept meadow.

THE CUBIC CITY

"TWO miles wide, two miles long, and two miles high is eight cubic miles. Eight floors to the hundred feet or four hundred to the mile give three thousand two hundred square miles of floor space. This is as large as an ancient city forty miles long and twenty wide, covered solidly with houses four stories high; and no part of it is more than two miles from any other part."

"Obvious," answered I, "but not enthusing."

"You do not click it," shrugged my guide. The phrase intrigued me and I stared at him. He was neatly uniformed in dark olive-drab, like a hotel bell-boy; but few bell-boys have such a chin and none such eyes of flashing dark intelligence.

"Try it from another slant," he said. "We have no traffic problem."

"What is your population?" I asked.

"About eighty millions."

"You are not overcrowded," I sneered. He took me seriously.

"Eight hundred floors," he said: "about a hundred thousand to a floor. That is twenty-five thousand to the square mile and forty persons to the acre. We give a thousand square feet of floor-space to each. That is enough."

"Where do you get your light?"

He flung his hand upward. I thought the passage flooded with sane daylight; but now I saw that the light rose from behind a narrow cornice and was reflected from the white tiles of the ceiling to those of the floor. "Helium tubes," he said, "Exactly the same quality and intensity as sunshine. Here is your room." He unlocked a door and set my suitcase inside. I motioned him in after me.

"I come from far away," said I, "and am behind the times. Make sure, before you go, that I can understand your conveniences. What, for instance, is the number of my room?"

"400-1-50-27," he answered, and handed me a tagged key, then translated, "Floor four hundred, south section, passage fifty, room twenty-seven."

The room was large—about twenty feet by thirty—and white. It had a low divan across one end and held two or three easy-chairs and tables, but was, on the whole, sparsely furnished. The young man waved me to a chair and sat down himself.

"I see no windows. How do we get ventilation?" I asked.

"Compressed air is released near the floor. It goes out into the passageway through that ornamental steel grating over the door. In summer its expansion cools the rooms. We keep a brisk, cool, even temperature all the year round. Here is the electric heater if you want more warmth, the fan if you want a breeze. This is the bathroom door. Here is the light switch, here is the Graph."

"What is a Graph?"

He looked at me intently.

"I thought it universal in the world," he said at last, "even—pardon me—on farms."

"Do I look like a farmer?"

"Not in the least!" he answered, briskly. "But——but——"

"I am an explorer," I smiled. "I have been away from your modern cities for a long time. Many things in your ultra-modern civilization puzzle me. Explain as if I were a child."

Pleased by my confidential tone, he answered: "Press this black button, dictate against this disk, and take the printed record from this drawer. Press this white button, manipulate this dial, and speak to any person in the city; or ask for Central and get any person in the world. Reverse the switch and get music or lectures on the first button or any book or play you like on the second. The rear of the disk throws the image of the person you speak to or the moving-picture of the play or book upon that mirror."

"You spoke of a newspaper?"

"The same disk with this second switch thrown. Push button for numbered table of contents, then manipulate the dial and hear and see what news you

REV. LOUIS TUCKER, D.D.

THE present story is one of the most extraordinary ones which it has been our good fortune to read in years. It is another one of those that will make history. As you read the story, you are not certain whether the author is serious or whether he laughs up his sleeve at the failure of the human race in general, particularly when it comes to the big problem of transportation and human conduct in large centers of population.

One of the strangest, if not the strangest phase of our civilization, is found in our city transportation. The automobile which was supposed to save us a great deal of time on account of its speed, has been signally defeated in our large cities and even the medium-sized ones. Today, the automobile as a vehicle to move people speedily has signally defeated itself. Due to the very large number of automobiles, their effectiveness has been nullified and in our big cities, you can walk short distances much quicker than ride.

The author of this story must be given credit for having developed a most unusual as well as original idea, which is not only original, but highly plausible. The city which he plans does away with all traffic problems as we know them today and you are constantly asking yourself the question, yes, why not? Indeed, we believe this story to be prophetic, because sooner or later some such city as foreseen by this talented author will come about.

We only hope that the author will have some similar treats in store for us in the future.

wish."

"What happens if I make a mistake?"

"If it is your own, return everything to zero and try again. If it is a mechanical mistake, like leaving both switches down, everything returns to zero automatically."

"What are the fees for this?"

"Included in the rent."

"Excellent. Where do I eat?"

"Synthetic liquid foods from the dialed ice-water-faucet in the bathroom. They are made automatically, in bulk, so cheaply that there is no charge for them. Busy people live on them for weeks at a time, but they lack bulk and vitamines. Real meals are served at any restaurant along the passageway."

"Thank you," I said. "I will not keep you longer," and handed him a quarter. He looked at it long and curiously, then spun it away, sprang to the graph and began to dial, trembling with wrath. "Room 400-1-50-27," he barked; "Cartex speaking. Send police. Attempted bribery!" I might have tried to soothe him, but he fell back into his chair unconscious. I tried to go to him but had just strength enough to stagger to a chair myself.

Interrogated

I ROUSED to find two quiet strangers in the room. The one bending over Cartex remarked, "There was a little too much gas. We'll have to wait." His voice was very calm.

"What is it all about, officer?" I asked.

"What did you do?" countered my own man gently.

"Gave him a tip. We always tip the bell-boy where I live," I answered.

The two policemen eyed each other and I took a long look at them. They had the same prominent chins as Cartex and eyes of dark intelligence and were dressed much as he was. They were, however, agreeably unexcited.

"What is a tip?" asked one.

"Money for carrying my suitcase," explained I.

"The custom still survives in Central Africa," commented the other. "Do you live there?"

"No, though I have been there. I live in New York."

Cartex' man raised his eyebrows and answered, "This is New York."

Before I had recovered from this thunderbolt he went on, "Uganda keeps the custom because the blacks there feel themselves inferior to the whites. Here there are no such social strata. Cartex misunderstood. The insult was too great."

"Where there is no intention to be insulting there is no insult. Cartex looks intelligent. He will forgive me. What did I do?"

"You assumed that Cartex was your social inferior."

"Isn't he?"

"Certainly not. Cartex is a dramatic student working along to a degree."

"But, even so, a coin or two from one who has a larger income—"

"Your incomes are the same. By the way, let me see your service card. We need your name, age, place of origin and data."

"What is a service-card?"

The two men looked at each other again and there was so long a pause that, during it, Cartex woke up. He did it thoroughly and all at once, like a kitten.

"Cartex," said I, "I learn from this man that I was rude to you by offering you money for service rendered. I did not understand. I beg your pardon."

"He did not mean to bribe you," explained my man.

There was another pause, while Cartex visibly controlled himself and considered. At last he smiled.

"Then there was no offense," he decided; "I withdraw charges."

"Excellent," said my man. "Come tell the Judge. The stranger has no service-card. Where did you find him?"

"Walking along this passage with his key in one hand and a suitcase in the other. He asked the way to his room."

"Where is the suitcase?" snapped the other man. They searched the whole apartment but could not find it. "What did you do with it?" my man demanded at last.

"Nothing," I answered. "Cartex set it just inside the door. I have not seen it since."

Ruffled by this, they took me along a hundred yards of passageway and entered an elevator in silence.

"How do you manage an elevator-shaft two miles high?" I asked Cartex.

"We don't," he said. "We break the trip every few dozen stories."

"And ease the pressure on your water-pipes by tanks every few stories also, I suppose?" I continued.

"Of course," agreed Cartex.

The court had graphs and dictaphones enough and very few spectators, but otherwise it was much like my idea of such places formed from the illustrated papers. The judge was a quiet, thin, clean-shaven, courteous man in a black gown, more like a high-grade surgeon than a judge. He ordered me seated in a very comfortable metal chair, upon a rubber mat under a very powerful arc-light, then flashed blue lightning at me from under his white eye-brows and asked why I was there.

Lost In Time

"I UNDERSTAND," said I, "that there is some informality about what the quiet gentlemen with the heavy shoes call a 'Service-card.' My young friend Cartex also preferred a charge of bribery against me, but courteously withdrew it on learning that I had no such design."

"Explain," said the judge to Cartex; Cartex did

"What is your name?" the judge then asked me.

"Griswold Lee," answered I.

"Where were you born?"

"Baton Rouge, Louisiana, Jan. 2, 1895."

The keen, thin, tired face of the judge suddenly changed. His interest in me had been professional. Now it was personal and vivid.

"Where do you live?"

"Brooklyn," I said, and gave him my address on Remsen Street.

"What is your occupation?"

"First, soldier; then, after the war, explorer and free-lance imaginative writer. The world would not believe my discoveries in Thibet when I presented them as facts, so I was compelled to dress them up and sell them as fiction."

"How did you get here?"

"I do not know, Judge. Twenty minutes ago I was sitting at my desk in Brooklyn, writing an article. Suddenly, I found myself walking down a passageway in this hotel with a tagged room-key in one hand and my suitcase in the other. I looked around for the bell-boy who should be with me, but found no one. Then I met Cartex."

"What was the subject of the article?"

"The probable development of the ultra-modern city."

The judge looked at me too intently for comfort. Then he asked a quiet man in one-piece tan overalls, who was sitting at a keyboard watching a plotted curve, "Inspector, can you detect a hiatus?"

The man looked up and shook his head. He had so keen and kind a face that I liked him. "There is no hiatus," he answered.

"When an impossible statement is made under the *Veriscope*," the judge explained, speaking with clear-cut precision, "only one course is open to the court—to detain the subject for observation by competent alienists. Mr. Lee's delusion that he is in a twentieth-century hotel is clear. Mr. Lee, permit me to compliment your self-control. You have passed through some unknown experience so drastic that it has not only deprived you of your service-card but has obliterated from your mind all memory of itself and of your personal identity; and still you retain mental poise and balance. It gives me great regret that I have no choice except to commit you to a psychopathic hospital for observation, upon the charge of Inurbanity. I am required by statute to ask if you have any requests to make before this is done?"

"It would be a great pleasure to see your city, Judge," said I, "and Cartex who, I understand, is a dramatic student working through college as a bell-boy, was kind enough to overlook my involuntary rudeness and withdraw charges, thus making himself my friend. If Cartex might be assigned to guide me—"

Cartex rose to object, but the judge spoke first.

"There is no hiatus," he said; "Mr. Lee accurately states both his opinion and his wishes. It might be of assistance to a diagnosis to act upon them. Has Doctor Gray arrived?"

"Here, sir," nervously answered someone from the door.

"Mr. Lee," went on the judge, "Cartex and Doctor Gray have long been friends. They will act as your escort. The suspected defect, Doctor, is Inurbanity. You may familiarize yourself with the details of the case from the newspapers. Verdict suspended and subject remanded to the care of Cartex and Dr. Gray. Next case."

Dr. Gray came over and spoke to me. He was dressed much like Cartex—a keen pleasant dapper little man middle-aged, with a brown beard and hair and eyes. He clipped his words as if in a hurry. When Cartex joined us the Doctor led us out into the passage.

"There is so much we need to tell each other," he began, "that we had better go where we can talk. Where shall that be?"

"The sunparlor is not crowded at this hour," suggested Cartex.

In a cubic city nothing is more than two miles from anything else. The average distance is about half a mile. The doctor was of a methodical as well as a nervous turn of mind, for, as we strolled along he laid down lines along which we were to talk. I did not fully follow him, because a woman and two children in rose-silk knitted bathing-suits and slippers came out of an apartment and sauntered along the passageway in front of us. They made a charming little group, not out of place on any sea-beach, but singular indoors.

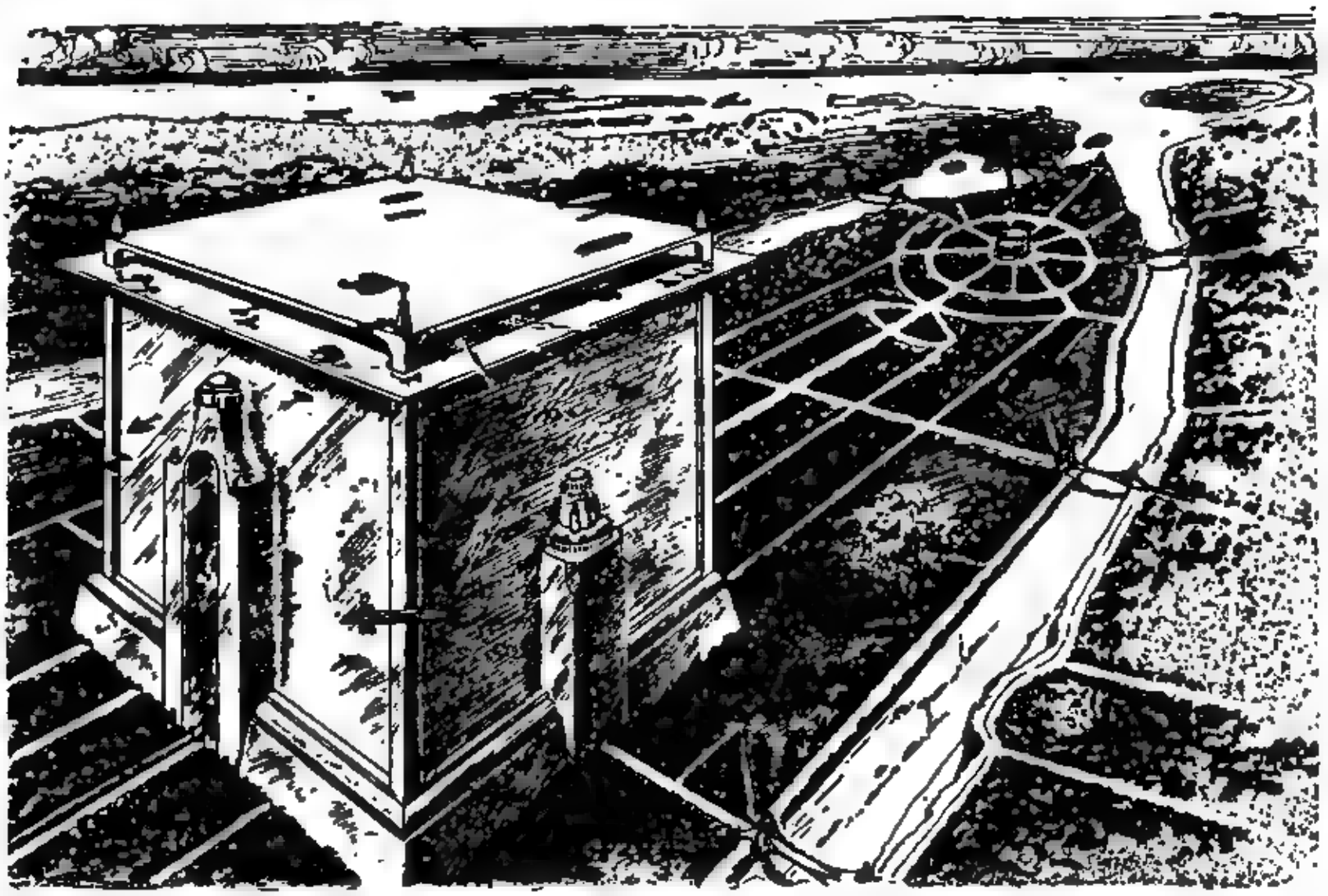
Then, suddenly, my breath was taken away, for the passage debouched on a great esplanade forty feet wide and two miles long, roofed, floored and walled with glass. Roof and floor were translucent so that we could see other levels under and above us. At first this made me dizzy but one soon grew used to it. We had come out about halfway up the wall, facing southwest, so that we were a mile high and the view was magnificent. We looked across North River and New Jersey exactly as one might from an airplane. I had been up in an airplane over New York more than once so that I recognized the terrain. But I recognized nothing else. We were above the southern end of Central Park, but New York City was gone. Manhattan Island was a well-kept meadow, grassed, treed and parked.

"You seem to have received another shock," said Dr. Gray. "Sit down."

I Explain

RECALLED to myself I look around. The inner half of the glass floor rose a trifle and was filled with steamer chairs; and in these chairs, basking in the spring sunshine, lay quite a number of people in bathing suits, while others strolled along the pathway.

"Sunbathers," said the Doctor. "The glass is



The Cubic City is two miles wide, two miles long and two miles high. It has eight hundred floors, and is as large as the ancient city forty miles long and twenty wide. Its population is eighty million.

quartz glass and lets in the actinic rays. Everyone who can get the time takes a sunbath every day. All doctors prescribe it."

"The place does not seem crowded," I remarked.

"The population of this floor is a hundred thousand. It has eight miles of glass promenade all exposed to the sun's rays every day. It could accommodate a hundred thousand reclining chairs; but we find two rows of twenty thousand each enough except on Sundays. The sunbathers on week days are mostly women and children."

"Cartex told me you had a thousand square feet of floor space to each citizen. Do you not waste too much of it on these sunbaths?"

"About sixteen square feet each. If it took more it would be worth it; but Cartex referred to space inside the building. These galleries are extra. Our board of health finds them indispensable. Not only do they cure disease, but they form the best possible way to detect it. People in bathing suits cannot conceal much about physical condition from a keen-eyed doctor. We catch and cure most things before they are well started."

"But are not the suits a little—er—extreme?" I asked, watching a couple of sixteen-year-old girls stroll by.

"We have some regulations," shrugged the doctor, "but, as a general thing, our policy is to let all do what they like so long as they do not interfere with other people. If those girls were ugly the Art Department would drop them a hint, if they seemed likely to become immoral they would be regulated instantly by Child Welfare—we can't have unauthorized babies—if they appeared unhealthy the Health Department would put them through a clinic; but, as it is, if they like to expose a few more square inches of young complexion than do most, nobody cares. I dare say Cartex' bathing suit is scantier."

"Hush, Doctor," warned Cartex, laying a finger on his own lip—"or read the papers."

"So far as I can understand my case, Dr. Gray," I said, "You are to examine me for insanity or 'Inurbanity', whatever that is; and through the courtesy of the judge, you are showing me the city and observing my reactions as the easiest way to make a diagnosis. Is there nothing I can do to assist you to a belief that I am sane?"

"Tell me just how you got here," answered the doctor, "which I already know from the judge you cannot do."

"I can come pretty near it," answered I. "Although of course, only by inference, since I remember nothing. Doctor, have you ever summoned up pictures in your mind?"

"No man discovers anything without doing so."

"Dr. Gray," put in Cartex, "is one of our foremost mind-specialists and has even made an improvement in the *Veriscope* itself. Although ill from overwork he has assumed the duties of an assistant interne because of the great singularity and interest attaching to your case, Mr. Lee."

"Then, if he can grasp my old-fashioned technical phrases, he may perhaps help me. It has been my habit, Doctor, to picture mentally the scene I was describing. When I made a forecast I concentrated until I saw it. This power has grown with practice until quite recently it has become independently pictorial. I mean that in imagining a scene, I do not have consciously to create the details. They fill themselves in; often quite accurately. For instance, in a recent dispute as to the presence of a large stone in a salmon pool which I had never seen, I closed my eyes, willed to see the stream from above, picked out the pool, mentally descended to the bank, looked and found the stone there—also a blasted pine which nobody had mentioned but which both my companions recalled when reminded.

"The sensation was exactly that of visiting the place and the results were about the same. My explanation to them was that I read telepathically the picture in their minds. The thing is not clairvoyance because I do not go into a trance. However, I have been greatly puzzled lately by unexplained small objects in my room. In one of these scenes I chose to image to myself I picked a violet and later found a newly plucked wild violet in my fingers. I laid it on my desk and turned away and when I looked back it was gone. Amused by this I imagined treasure-scenes in the past in which I helped myself to gold and jewels. I brought them back with me and watched them fade after an hour or so. I could see no gain in telling another observer. *Autohypnosis*, vivid as mine, would necessarily be telepathic. Whether what I saw were there or not the other observer would see it too: and the practical dangers were great. Today I photographed several objects just brought back, sent the film to be developed, then settled down to finish a promised article for Jeems on the probable development of cities in the near future. I was intent on the most interesting part when I looked up and found myself here."

"The suitcase which you handed me was real," put in Cartex, "real, heavy, and utterly ancient. Did nothing which you brought back stay?"

I Learn Much

I JAMMED my hands into my pockets and produced the usual things—notebook, billfold, penknife, cigarette lighter, and silver and even copper change. Cartex went into ecstasies over each article and pronounced them all genuine antiques of the twentieth century. Among the pennies was a gold Turkish coin, apparently very ancient.

"Where did you get that?" asked Cartex.

"I did not know that it was still there. I see no reason at all for you to believe me, but I picked that coin in imagination out of the treasure-chest of an Elizabethan buccaneer. I thought it had vanished like the others."

"We believe you perfectly, Mr. Lee," broke in the doctor. "We have no doubt at all of your sincerity. We have seen you under the *Veriscope*. Of course we do not for a moment dream that your perfectly sincere account of yourself is correct; but we are searching together with you for the facts."

"Perhaps," said I, "it will help if you tell me how this great change in city-building came about. At least, it will assuage my curiosity."

"The financial life of a skyscraper was about twenty years," answered the doctor," although the mere physical life ought to be centuries. They altered quickly. They were made larger and still larger. Invention of the helium lamp, giving real daylight, removed the need for windows. The drift of population to the cities became an avalanche. Problems immense and sinister, such as the world had never seen before, arose and were grappled with one by one and solved, all but the problem of lateral urban transportation. How many street-levels in 1930?"

"Two," answered Cartex for me. *"Wilson on Transportation* says that bridged street-crossings for pedestrians did not come into general use until 1935 and then on main streets only. Sidewalks between crossings were not raised until some years later."

"Whatever the dates of separate improvements," shrugged Dr. Gray, "they came too late. The growing population overtook them all and clogged them. Yet inside the great buildings which continued to grow larger, there was no congestion, because there was no need of lateral transportation. Everything on any one floor was within easy walk of everything else. Men took an elevator to whatever floor they wanted, then walked to their destinations. Therefore each building tended to be more complete in itself, containing everything but sleeping quarters. At last it became economical to add a floor or two and give janitors, shopgirls, elevator boys, repair men, and such persons dormitories in the building. The custom grew until half the city was housed in the same buildings in which it worked; but since, by that time, the population had more than doubled, this did not ease congestion in the streets. Some help was gained by throwing bridges from building to building; but these became congested too. Bridges were thrown then from every floor of every building and so the cubic city was evolved. The rest was detail."

"What limits the size of your cube to two miles?"

"Air pressure. We find a difference in vertical height of two miles about all anyone can stand. Approximately the same limit is placed by horizontal distance. A mile and back is about as far as it is practical to walk."

"How many cubic cities have you?"

"Fifty-three in the United States: about three

hundred in the world. New York is the second largest."

"What is the largest? London?"

"Jerusalem. It is the nearest to the centre of land surface of the globe. When the Suez Canal became congested past enlargements we blasted channels to the Mediterranean and Red Sea, made Jordan Valley a salt-water inland lake and the safest harbor in the globe, and internationalized Palestine. The consequent growth in population made a vast cubic city necessary.

"Internationalized?"

"Certainly. The world is governed by a League of Cities."

"What is the population of the globe?"

"About three billion. Since we discovered how to extract synthetic foods from plants we could support a trillion; but we judged it best to limit our numbers and improve our quality. We can cure all diseases except some forms of cancer but we can not remove inherited stupidity."

"Cure all diseases? What is your average life, then?"

"About a hundred and fifty years."

"What is your average index of intelligence?"

"For the normal population, Theta. For all, including the subnormals, Zeta. For New York City, Kappa."

"I do not understand your table of ratings."

"We divide the mental distance between the greatest genius and the stupidest person whom we are quite sure is sane, into twenty-five parts. The average man in the whole world is one third of the way up. Cartex rates Sigma."

Sure enough, there was a little badge on Cartex' lapel which I had mistaken, at first, for a bell-boy's button, then for a Greek Fraternity pin.

"Doctor Gray rates Tau," smiled Cartex, bowing, "or did, before his illness. He may do better now."

"And how would you rate me, Doctor?" I asked.

"Above myself, except for your delusion," answered Doctor Gray, politely. "As it is, I am afraid that you must be classified as subnormal."

Cartex gasped.

A Revelation

"OH, no," he said, "not that, Doctor! On a side classification perhaps, abnormal perhaps, but not sub-normal. I never saw a case further from Inurbanity."

"Still, what can one do where there is obsession?" shrugged the doctor.

"Isolate it," insisted Cartex. "First isolate it, then cure it." He turned to me. "Admitting, for the moment, Griswold Lee, that your belief is right and that you have come here from two centuries ago by unknown subjective methods, how does the situation strike you? You are here now. The fact of your arrival is so plain that the method of it is comparatively unimportant. Is it not clear what your decision must be? Is not your proper course to apply for a service-card, take up the work for which you are most fitted and become a useful and a loyal citizen, dropping into the background, even in your own mind, the unsolved mystery of how you came?"

"To learn and labor truly to get mine own living and to do my duty in that station of life to which it has pleased God to call me?" I misquoted, smiling. "You are quite right. Of course it is."

"There, Doctor," triumphed Cartex. "When an obsession can be so easily mentally isolated as that, it is no longer dangerous."

"You seem intensely interested in this stranger," objected Doctor Gray.

"I am, Doctor," nodded Cartex, "though not as you imply. He named me as his friend in open court, not knowing. I have had admiration all my life from other men and sometimes even affection, but never honest friendship. It has grown mutual."

"I think the gentleman has two obsessions."

"Think it in silence, then," shrugged Cartex," or I shall be your enemy for life."

"What," smiled the doctor, sadly, "is a poor official to do? On the one hand I must brave your displeasure or, on the other, I must release upon Society a man who really, on two counts, is not urbane."

"What is this 'Inurbanity'?" I asked.

"When people crowded together in cubic cities," answered Doctor Gray, "We found that it was possible to commit a great many offences for which there was no law. We therefore made laws against such things as hawking and spitting, giggling, loud laughter, talking in raucous voices, bad temper and a thousand other like matters. These laws could not be enforced. Any good lawyer could clear his client; for they are all matters of degree, dependent upon manner, time and place. Yet any one who did not choose to keep them could make all comfort quite impossible for hundreds round him. A few such men and women, comparatively a few, could have destroyed our rising new civilization. Therefore we lumped these things under the head of 'Inurbanity.' People with 'Ists' and 'Isms', criminals, people mentally ill without being quite insane, people incurably boorish and stupid, people with complexes and phobias, people deformed, all people, in short, who bother others too much and will not or cannot change, are classed as 'Inurbane.' In a safe, simple, painless way they are made incapable of bearing children and are confined for life in humane institutions outside the city. Most of the institutions are almost empty. We have no longer any criminal classes. We have no insane, no idiots, no crippled or deformed, no one with inheritable diseases, no drunkards nor drug-addicts and very few extremists of any kind."

"Also no rebels, I suppose," said I, "and no reformers."

"Plenty of both," bowed the doctor. "Cartex here is a great rebel against dramatic conventions, and every new scientific discovery means drastic

reforms; but every rebellion and reform must be courteous and urbane."

"How, then, shall I become urbane?" asked I.

"Personal consultations should be private," remarked the doctor, and reaching over me he raised a lever in a little machine upon a stand beside us; which machine I had mistaken for a radio.

"Quite the most urbane thing you have done yet," he went on, "is to give me a good excuse for shutting off the news-service."

"News-service?" I asked.

"Did you not know that there were several million people watching and listening to us?" flashed Cartex. "The doctor and I are made for life professionally by the publicity of our association with you. We have become world-famous. Your coming is world-news——"

"I am made for life emotionally also," beamed Dr. Gray. "The lady whom I love must marry me or——"

"Indeed she won't," said Cartex, indignantly. "She marries for love only. Doctor, you are inurbane."

The doctor started to his feet so angrily that I thought it best to take command.

"Doctor, sit down," I suggested. "Even in my poor day anger was inurbane. Cartex, a bell-boy, even a student bell-boy, should not speak so to an eminent physician. What is the secret you two are discussing over my head?"—and under cover of gesturing with my handkerchief I turned the machine-lever back on.

"I *said* there were two inhibitions," sneered the doctor.

"Nonsense," returned Cartex. "It is the most natural thing in the world. He has not seen another of our women except in a sunbath-suit. You shall not hurt him. No woman now living had ever received or been in a position to receive so great a compliment—honest, sincere, non-sentimental friendship from a real fighting man. Don't spoil the situation.

"Cartex, you little devil," I broke in. "You look like a boy, talk like a boy, act like one—but *are* you a boy?"

"What do you think?" dimpled Cartex, facing me.

"Take off your coat," said I.

He did so, and stood in his trousers and a silk shirt.

"Must I take off my shirt, Master?" he asked. "I have a sunbath suit under it."

"Which would you rather do, take it off, or come here and let me put my arm about you?"

"Both," decided Cartex.

"Cartex," protested Doctor Gray too loudly for politeness, "Don't be dramatic."

Inurbane

"WHO should if I am not," flashed Cartex from the hollow of my arm. "You know I can do anything in reason and be forgiven."

"Griswold Lee," said the doctor, visibly controlling himself, "Cartex is one of our best comedy actresses, a darling of the Metropolitan stage. She can care nothing for you. She has not known you long enough. She must be trying to attract you to her to share in your enormous publicity. But she has gone too far. She jeopardizes her position. Restrain her. She must be acting, but, to those who love her, such action is not comedy. Cartex, unless you marry me I must report this man inurbane. Lee, in that far land you think you came from were you married?"

"No, Doctor. When I came back from the war the girl I was engaged to had married someone else. Since then I have been girl-shy."

"Girl-shy? Great grief!"

"There's such a thing as love at first sight, Doctor. I don't know whether Cartex feels it yet, but I do."

"You darling," gasped Cartex, turning around in my arms and kissing me.

"You light-o-love," snarled the doctor—only he paraphrased it. Then he struck at her.

There seemed only one thing to do, so I did it. The doctor disappeared under a chair, drummed with his feet a little and lay still; and sunbath-suited women from a hundred lounges jumped up and screamed.

"Run for it. Run." gasped Cartex.

"Where?" asked I.

"This way. My room."

The way seemed to be along a passageway, just around a corner and down an elevator. Cartex employed the moment's pause while waiting for the elevator and stepped into the car dressed just like any other woman who had been sunbathing, except that she was barefoot. The elevator girl recognized both of us, but did not know anything had happened. Cartex led me to a door, unlocked it and shut us both in.

"Now," she said, "tell me that you love me."

I had but well begun when the Graph buzzed. Cartex wiggled out of my arms and ran to it.

"Interurban News speaking," it said. "Is this Miss Cartex? Confused reports have come to us that you have been abducted by a maniac."

"Is that you Jimmy? I thought I knew the voice. Turn on your television. I have not been abducted. I am in my rooms, just back from sunbathing. Mr. Lee is not a maniac, but the wisest man I ever met. He fell in love with me at first sight. He is with me now. I fell in love with him; Jimmy, we want to get married. Help us."

"Have you no mercy, Cartex?"

"You never really loved me, you know, Jimmie. You love news better. Get me a license and a minister and I will—I will energize my mirror and you may have the pictures. Think of the scoop!"

The Graph blurred for a moment, then came clear, and said:

"They tried to cut us off. What did you do to Doctor Gray?"

"I cannot prove it, Jimmy—the Visional was off-but the poor man was ill. He had a nerve-crash and

tried to blackmail me into marriage by threatening to declare Griswold Lee inurbane, then called me an insulting name, then struck me. Griswold hit him on the point of the chin and he was still insensible when we left."

"Energize your mirror, bar your door, look out for gas, and we will do what we can."

CARTEX came back into my arms, but this time she did it slowly, gradually, superbly. "A million people are watching us," she said, "and thousands yet unborn will listen to what we say."

"Are you as important as all that?" I asked.

"No; but you are. We live so safely in these modern cities that nothing as exciting as this has happened in a decade anywhere. The world and I know that you have come back from two centuries ago whether the city fathers believe it or not."

She pressed a button, ran a finger down a list, dialed the Graph a moment and a quiet voice filled the room.

"Latest developments in the Griswold case. The two most instantaneous lovers in the world take refuge in Miss Cartex' apartments. Miss Cartex bargains for a marriage license and, with her usual modesty and good sense, turns on the Visional. Surgeons say Doctor Gray will recover. Griswold Lee, the only professional soldier now in the world, does not understand the publicity accorded him. See our illustrated section."

"You see the whole world is our chaperone," remarked Cartex and leaned out of my arms to turn off the Graph. There came a whir in the wall and a panel fell open. She took out a pneumatic container, opened it and displayed a marriage license. The Graph whirred again.

"The Reverend Dr. Worden of St. James' consents to perform your marriage ceremony. Hurry, before Dr. Gray interferes."

"All ready, Jimmie," answered Cartex. "Go."

There came a sound of distant organ music. It ceased and the mirror at the side of the room was filled with the image of a robed clergyman who married us, his deep voice coming out of the Graph instead of from his moving lips. Neither of us wore a ring, so Cartex fetched one from her bedroom. The ceremony over the clergyman disappeared and the Graph whirred.

"Doctor Gray has recovered and sworn out a warrant against Griswold Lee for attempted murder. Accept congratulations on your marriage. Keep your door barred, cut off your ventilation and have your husband instantly dictate to us a twenty-minute account of Brooklyn and New York in nineteen-thirty, distinguishing carefully between what he has heard or read and what he knows of his own knowledge to be correct. If he gives detail enough we can verify from antiquarian records, prove his claims, and save you. Otherwise you will probably both be convicted of inurbanity and attempted murder."

"Jimmy, that's brains!" cheered Cartex. "Two breaths ago I did not see any way out except to spend a honeymoon besieged here and end in death. Now you have saved us. Dictate, Griswold."

"I don't know how to use the Graph."

"Then I will relay it. Hurry. Begin!"

The door-bell buzzed.

"New York," said I, "in my day was immune to noises. Upon the street we could often hear each other speak, but in the subways we could not hear ourselves think. We grew so used to this few noticed it."

There came a heavy knocking on the door. Cartex bolted it, barred it, jammed the overturned kitchen table slantwise under the lock, and made a notch in the floor to hold its lower end by ripping up tiles.

"In 1930 Castle Garden still contained fishes," I went on. "The Metropolitan Museum in the last twenty years had sprouted more wings than a cherub. We had learned how to fly. The *interferometer* had taught us to tell the size of stars, both on and off the stage. The word 'Camouflage' had not yet come of age. The first tunnel under North River had just been finished, the first bridge just begun. Drinking was in a state of arrested development. Bootleggers had no souls but only spirits. Women had dropped their superstitions and ceased to dress for the Unseen. Entering uninvited anywhere was impolite and was spoken of as 'Crashing'. Somebody in the passage is trying to crash our metal door now, with a beam. Cartex, since the ill-mannered persons outside are so afraid of gas, would not a bottle of bath ammonia poured on the rug over our ventilator, together with some strips of silk and cotton burned in a dish beneath it, send them away?"

"Try it!" called Cartex and the Graph together. She ran into her little kitchenette to get the dish, and screamed. I dashed in after her only to plunge into the arms of a small wiry policeman. I smashed him back against another. The third, his arms round Cartex, was Doctor Gray.

If the dumb-waiter had been larger I really do not know what would have happened; I suppose they sent up little men because big ones would have stuck in it. Even as it was, the fight was desperate. I settled Dr. Gray in the first second. He could not guard himself because his hands were full of Cartex. Then Cartex kept out of the way, but whenever I was hard pressed she ran in and hit one of the policemen on the head with a chair-leg from behind. When they were both unconscious we tied them up and sent all three down the shaft in the dumb waiter, one at a time, then jammed the waiter crossways, cut the wires and stuffed blankets on top of it. By this time some one had a blowtorch against our front door, cutting through the metal. We set some more rags of cloth on fire and they ran, but returned.

I started a description of my own Brooklyn room. As I looked around at Cartex' luxurious nest it was easy to recall and describe my own bachelor discomforts. For several reasons I kept Cartex in my

arms. The Graph before me blurred, then cleared again as the door broke in. I tightened my arms around my wife and went on visualizing my own room. Then slowly I found myself sitting at my desk in Brooklyn, with my landlady clinging to me.

* * * * *

It would make another story as long as this to tell how I made the dear lady all the necessary explanations, going into details scrupulously. So she decided that she had better marry me. We have gone out to live in the country. She is as happy as the day is long except for one small inurbanity—a quite unnecessary one, for I have now fallen out of touch with the gentlemen in Thibet, under whose auspices I once studied. They do not approve of matrimony. Yet, even now, she will not permit me to write a story unless she is allowed to act as my amanuensis.

THE END

New Science Fiction

WE have prevailed upon a number of our outstanding authors to write for us some new science fiction stories.

These stories are now available through our new library entitled:

"Science Fiction Series"

Six books have been prepared with the following titles:

"THE THOUGHT PROJECTOR," by David H. Keller, M.D.
"AN ADVENTURE IN VENUS," by R. Michelmore
"THE BRAIN OF THE PLANET," by Lilith Lorraine
"WHEN THE SUN WENT OUT," by Leslie Stone
"WHEN THE MOON FELL," by Morrison Colladay
"THE GIRL FROM MARS," by Jack Williamson and Miles J. Breuer

These books are available at the small price of 10c each.
For further information, turn to page 291.

Science Wonder Quarterly

PURSUANT to many inquiries from our readers, we are pleased to announce that the first issue of the SCIENCE WONDER QUARTERLY will be published on September 15th next.

We have secured for the first issue, the American rights of a complete new novel by the famous German science fiction author, Otto Willi Gail. This is one of the most unusual interplanetarian stories ever published. The title of the story is

"THE SHOT INTO INFINITY."

The subscription price of the QUARTERLY is $1.75 per year, single copy 50c.

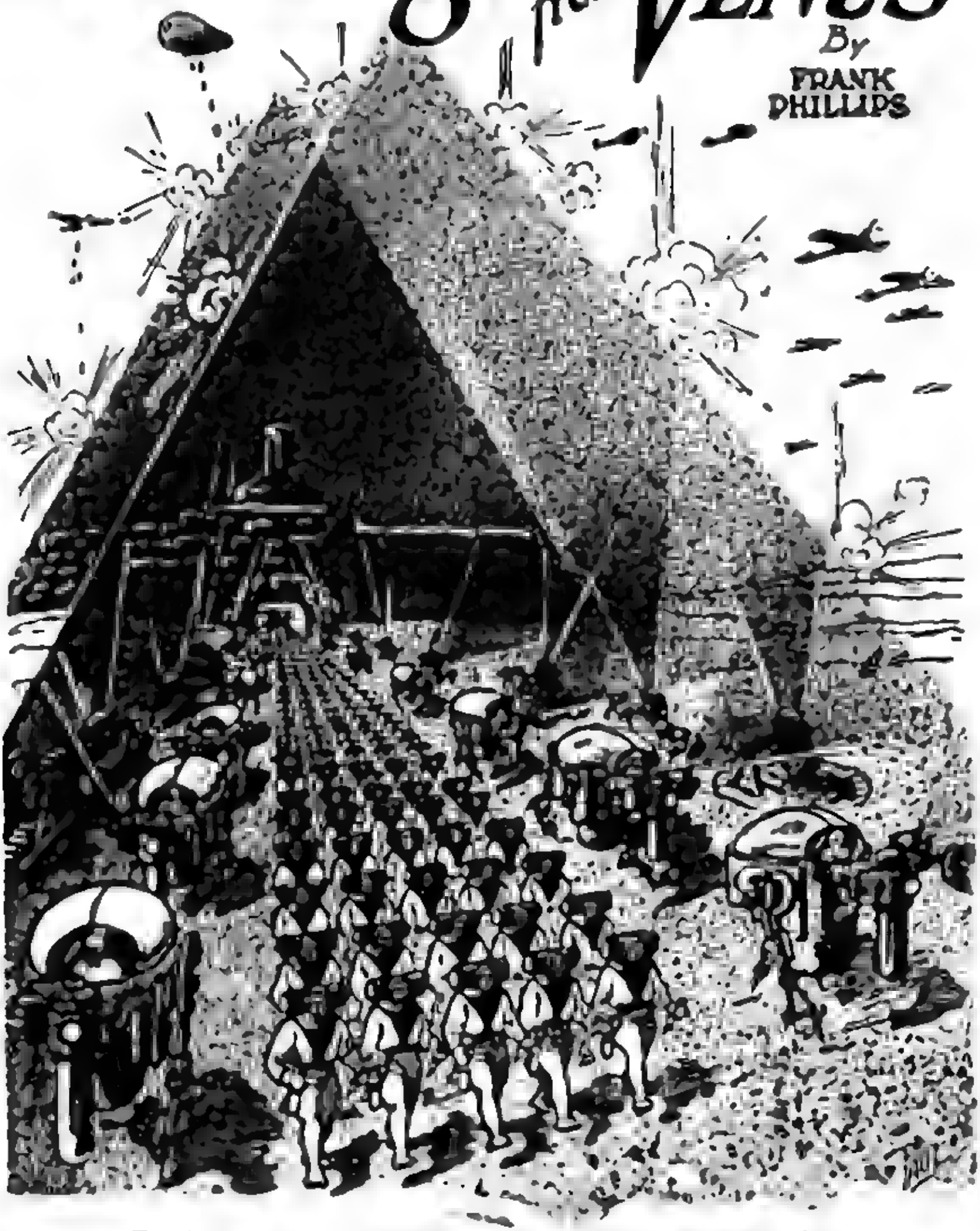
To all charter subscribers, a special rate of $1.25 is available now.

Address all communications and make out all checks to:

STELLAR PUBLISHING CORPORATION
96-98 PARK PLACE NEW YORK CITY

The Onslaught from VENUS

By FRANK PHILLIPS



The column of soldiers was winding its way across the plain in the direction of the beleaguered fortress. In the center marched the infantry and on either side a column of fighting machines on foot—the legs spread a fan of rays over the soldiers.

THE ONSLAUGHT FROM VENUS

WHEN half the population of the planet Venus hurled itself across the void of space at our own world, believing they were going to find a new home here, I was one of the first prisoners they took. As a matter of fact, I fell into their hands before one of them had set foot on Earth, when their first "bulb" was still 18,000 feet above it. It was a cloud bank that proved my undoing.

We of the Airguard had had our warning, but were uncertain as to what to expect. The observatories of the Rockies, Alps, Andes and Himalayas had noted the mysterious objects bursting out of the cloud envelope of Venus, on orbits obviously calculated to bring them within the Earth's gravitational influence.

FRANK PHILLIPS

There could be no question but that some human-like intelligence was back of the mystery. The observatories flashed their warnings to the Central Astronomical Board, which in turn reported to the Supernational Commission of the Caucasian League, in Geneva.

But the board went astray in its interpretation of the phenomena. Its theory was that the several thousand hurtling bulbs or spheres photographed by the observatories were projectiles containing explosives or some other agency of destruction. Actually they housed from 400 to 2,000 men of Venus apiece, fleeing their planet. They were trying to escape annihilation by volcanic forces that had gotten out of control after several centuries of increasingly ambitious use.

About half the population of Venus lacked the courage to face the terrors of interplanetary space in a desperate gamble for continued existence. Presumably they perished in the Doomsday which followed, and which was visible to our observatories as terrific disturbances and upheavals in the Venusian cloud envelope.

Of the other half, who exchanged their few remaining weeks of existence on Venus for the desperate chance of hitting a pinpoint in space, and finding it habitable after hitting it, relatively few reached the Earth. Had a majority done so I question whether we could have withstood them so successfully, with their terrible weapons.

We would have overwhelmed them by sheer numbers in any event, of course, but men would have died by the hundreds of millions and the rest of us would have returned to the dark ages if we had not been able to overcome them before they deranged that delicate balance of production, commerce, finance and social structure that we call civilization.

From what I learned as a prisoner, our astronomers actually discovered only fifteen or twenty percent of the total number of "bulbs" launched. Altogether more than 47,000 of them were hurled toward the Earth, carrying about 45,000,000 Venusians (the total population of their planet being only slightly over 100,000,000.)

Only 1,600 of these "bulbs," with "crews" aggregating 1,400,000 actually reached Earth. Thousands of them were shattered by collisions with meteoric bodies. Thousands more were deflected from their course by unforeseen gravitational influences exerted on them and they hurtled on into space past the Earth. Still other thousands were estimated by the invaders themselves to have missed the target through errors in calculation, and the imperfection of hurriedly constructed space "guns."

But to begin at the beginning, I was patrolling the air lanes above Northern Mexico, about a hundred miles south of the Texas line, with "Tubby" Baines handling the radio and telescopes, while "Eggy" Morris sat at the guns of our Randall. This was then the newest type of plane in the Air Guard, a ship of remarkable balance and steadiness for those days, with an easily sustainable speed of 300 miles an hour, and a cruising radius of 6,500 miles.

As far as the eye could reach, and the scopes too, for that matter, the air was filled with patrol ships, each circling the territory of its beat and waiting for we knew not exactly what.

The "bulbs" were due to arrive at any time now. From one end of the continent to the other, and throughout Europe, the Supernational League's Red Cross Division had been mobilizing relief organizations. City populations had been

HERE is the versatile author of "Armageddon 2419 A.D." and "The Air Lords of Han," with a brand new thrilling story.

There are those authors whose chief claim to our attention is their imagination and those who in addition are inventors of no mean degree. The present author is a combination of both, and in addition, he knows how to create action stories that are difficult to match anywhere.

Mr. Phillips has a knack of inventing new instruments that are as new to literature as they are to science, and there is no denying that his scientific creations are plausible and will be duplicated when the various arts have caught up with his scientific prognostications.

It is always most interesting to us to speculate on what would happen if some alien intelligence from another world—granting that it exists—would invade this planet. Many authors have tried their hand at such a theme, but few are as forceful and versatile in picturing such a conflict as is the present author.

In addition to this, he shows convincingly the importance of terrestrial conditions as they will be experienced by alien invaders.

ordered to scatter temporarily into the open. It would not do to have one of these bulbs hit closely massed millions, if they were explosive.

Our orders in the Air Guard were indefinite. We were to patrol, watch, report and stand by for further orders. We were to spot any hits of the interplanetary projectiles, so that relief might be rushed to points needed with the least delay. We were all at a pretty high tension.

Far above us, to the South, was a big cloud bank, and it was in the middle of the afternoon that Tubby sang out to me the general order he had just picked up. All Randalls were to rise out of position, and head South a hundred miles at whatever level was necessary to carry us above the cloud blanket. Observations, it seems, indicated that most of the oncoming bulbs were falling toward the Tropics.

I nosed upward in a long easy slant that took us into the cloud bank. Once in it we could not see forty feet ahead, but I kept the Randall rising at full throttle, for I knew there would be no other plane within miles at this level.

Captured!

I CAN'T tell just how it all happened—it took place so rapidly—but I was conscious that our plane was entangled in a vast mass of billowing, canvas-like material. It closed around us in overwhelming folds as we buried ourselves in it and brought up with a sickening lurch.

Tubby's face bore an expression of ludicrous surprise as he spread-eagled over my shoulder, sailed over the rail, and disappeared, scratching desperately for a hand-hold as he slid down a trough in the billowing fabric. That was the last I ever saw of him.

I have no recollection at all of what happened to Eggy. I never saw him again.

For a moment I clung to the rail as the Randall slowly turned over. Then I lost my hold, and slid with increasing momentum down one of the folds of that vast enveloping fabric—a human insect, lost in a chaos of drifting canvas 20,000 feet above the Earth.

My hand touched a rope. I held desperately to it, and found it with my other hand. A short distance below me in the fog I heard a crash, evidently the Randall colliding with something bulky and metallic. Then silence.

Gradually the sea of canvas straightened out. I knew then that I was clinging to the edge of a vast parachute. But my whole mind was centered on self-preservation. I had no time to wonder. I went down the rope hand under hand, until below me in the mist loomed a section of a great metal dome. With my feet planted on this more substantial support I paused to regain my breath and gather myself together.

It did not yet occur to me that I had found one of the interplanetary bulbs. Like everyone else, I had it set in my mind that these would turn out to be explosive projectiles. Moreover I was completely dazed with the suddenness of it all.

Mistily, the metal dome curved downward in one direction. In the other I saw a railing a few feet away. I threw myself toward it and climbed over with a sigh of relief. The whole structure was swaying sluggishly, and was sinking, I was sure. But it had not fallen below the cloud as yet.

Then a hatch nearby flipped open.

Three men climbed hastily out. They were clad in what looked like divers' suits, covering them from shoulder to foot; and over their heads were large goggled helmets.

My surprise evidently was equalled by their own, for they paused to survey me amazedly through their big goggles. Then one of them signalled the others, and all three of them leaped upon me like wildcats. Taken utterly by surprise, I went down under their rush. I was hustled down through the hatch, which clanged over my head, and literally rushed down a corridor into a compartment that looked like a combination of control room and engineroom on one of our own big dirigibles.

The ship, for now I knew I was aboard some sort of strange aircraft, was crowded. My captors had to fight their way down the corridor with me. Some of the crew through whom they pushed were clothed in "divers'" suits and goggled helmets like themselves. Others wore sleeveless, belted tunics that reached the knees, and they looked to me as though they had emerged from flour barrels. Their skins were dead white, as white as Grecian statues. But their eyes were yellow and their close cropped hair a tawny orange.

In the center of the control room was a big instrument table, at which a marble-white man sat, surrounded by illuminated screens upon which appeared shifting pictures. Occasionally he would reach over and twist a lever, or flip a switch. My captors stood respectfully waiting for his attention. Finally he looked up and stared at me with piercing yellow eyes that looked out from a finely chiselled face that might indeed have been marble from its total lack of color.

But he had little time for me then. He waved his hand and turned back to his instruments. My captors hustled me off to a little compartment, where I was locked in.

Later came a slight jar. The ship had come to rest on the ground. There was a clanging of doors, and rushing of feet, babel of voices and harsh commands; and the sound of heavy machinery being hauled around.

My captors re-appeared, and literally dragged me down a spiral companionway to the lower decks of the ship, and thence into the bright light of day.

Squat Guns Cough

I LOOKED around in amazement. I had emerged from a great metal sphere about 600 feet in diameter. Around me was the greatest activity. Some fifteen hundred helmeted figures had spread out over the plain. Split up into disciplined groups,

they were busily setting up what appeared to be numerous searchlights and squat, broadmouthed anti-aircraft guns of complicated design.

In the sky above gathered a host of planes of our Air Guard, circling around, puzzled by what they saw below. Had they only dropped their bombs then, much bloodshed among our own people could have been avoided, but quite naturally in this day of civilization, they did no such thing.

They had reported to Washington and had received orders to make friendly overtures to the strange newcomers. One of the planes dropped below the formation and began to spiral down.

A few feet away from me one of the squat guns coughed. A blinding flash appeared some fifty feet away from the circling plane, which was irresistibly sucked into it. There was a miniature thunder-clap, and the twisted, incandescent wreckage of the plane dropped like a stone.

Another gun coughed hollowly, and another blinding glare of light appeared, this time in the middle of the formation above. It sucked in three planes; and their broken, twisted remains also plunged earthward.

Then our planes dived, their motors roaring. There was a sudden consternation among the white-skinned men around me. Guns coughed frantically. Hastily aimed bombs flashed, blinding even when seen against the bright sky. Two more planes collapsed, but the rest dived on.

More guns coughed. The attention of my guards diverted for the moment, I hurled myself headlong toward the nearest gun, whose crew was about to discharge it. I caught the feet of the creature whose hand was reaching out toward the firing mechanism, upset him, and rolled instantly to my feet, tugging at the automatic in the holster on my thigh. I got it out in time to fire point blank at another who leaped at me. He reeled, and I noticed as he went down that though the skins of these strange people were white, their blood was red enough.

I took toll of seven before they finally pinned me down, and my little diversion at least kept one of their guns out of action while the planes sprayed the groups of soldiers with a leaden hail, cutting them down by the score. Then the planes zoomed again to comparative safety.

By now, however, the invaders' machines that looked like searchlights got into action. They spread fan-like beams of iridescence overhead. These beams the operators quickly wove into an interlocking network, making virtually a continuous cone of pulsing light, its base the circle on which the machines had been set up, and its apex about a thousand feet in the air.

The planes of the Air Guard returned to the attack, this time dropping bombs as they passed overhead. I broke into a cold sweat. I knew the power of those bombs, and figured my life in terms of split seconds.

Then an amazing thing happened. *The downrushing bombs bounced off the cone-curtain of light as though from an invisible rubber wall,* and exploded harmlessly. Not even the fragments showered around, for these too bounced off in their turn. But the invaders were close to panic from the ear-splitting force of the explosions, and they manipulated their coughing guns in very ragged fashion.

Through the uproar their leaders rushed about angrily, beating them back to the posts they had abandoned. I saw more than one of them strike down a man with his short, heavy sword.

Not until the Air Guard planes had expended all their ammunition did they withdraw to the 10,000 foot level, where again they circled watchfully.

Altogether seven planes of the Air Guard had been shot down. About three hundred of the men of Venus lay killed and wounded within the circle. All these casualties, however, had been suffered prior to the formation of the protecting light cone which had thrown off bombs and bullets alike, rendering the second attack of our planes quite futile, although seemingly terrific.

CHAPTER II

Ultimatum!

INTENSE activity on the part of the invaders followed the withdrawal of the Air Guard squadron. A vast mass of machinery was removed from the sphere, which actually was taken apart in the process. Its plates and beams had been cleverly designed as interchangeable parts of other machines and constructive apparatus. Quickly interchangeable at that. I don't think it took more than an hour or so for the thousand men of Venus who were not casualties, or assigned to the task of ministering to the wounded, to completely demolish the great bulb in which they had arrived on Earth.

In its place there arose giant cranes, and complicated machines which began to dig and handle materials in huge masses, with uncanny skill and accuracy.

In the center of the circle was erected a cylindrical apparatus, which proved to be a boring machine. By some complicated process that was beyond my comprehension it began to dig a great well, the displaced earth literally flowing from openings in the side of the thing. As the mound of earth grew around it, the cylinder automatically rose in the center of this mound.

Other machines which squatted like huge metallic insects, occasionally raising themselves on leg-like levers to change their positions, reached out with great extension arms that terminated in universal-jointed paddles or "hands," each probably fifteen feet across, and scooped vast quantities of the earth toward the outer part of the mound.

Before long the removed earth assumed the proportions of a hill. The circular battery of fan-ray machines was moved outward, the number of machines being augmented by constantly assembled additions.

Then I noticed that the character of the earth flowing from the boring machine was changing. In a few minutes molten lava was pouring out of the

broad-lipped spouts. There ensued unusual activity on the part of the shovel-handed machines, whose operators, with a skill that held me enthralled, manipulated the liquid stone, absorbing the heat from it with accessory apparatus, and shaping it as it hardened.

Night fell, and the glow of the lava lighted the scene weirdly, tinting the dead white bodies of the invaders. By now they were mostly stripped. With the setting of the sun they had begun to remove their protective diver-like suits and goggled helmets, and for the most part were clad only in full-cut short trousers, not unlike kilts, that extended in pleats from highly ornamented, broad belts to a point several inches above the knee.

There were many women among them. In fact, about a third of them were women, but there was no distinction between their dress, or lack of it, and that of the men. Both men and women wore their tawny yellow hair close cropped. Nor did there seem to be any division of labor among them that was based on sex. All were working under high pressure at various machines, except the executives, those who were tending the wounded, and the three guards who never let me get beyond their reach. They permitted me free movement, however, within the confines of the circle so long as I did not approach any of the machines too closely, or get in the way of the bustling parties.

That more would be heard from our planes that night I know well. The traditions of the Air Guard, particularly the American Division, did not embrace much consideration of the principle of watchful waiting.

I had just looked at my watch—it was nine o'clock—when something white, a little weighted parachute floated down right through the cone of the fan rays, which spread a faint iridescence through the air above us. A white-bodied girl approached it hesitatingly, inspected it where it lay, and at last reassured, picked it up and ran with it to the commander.

I knew what it was; a note, an ultimatum, offering truce or war to the invaders. When the commander looked casually at it, handed it back, and with a word waved the girl away, I had a pretty good idea of what would follow. The Air Guard would be watching through their night scopes, and probably would get a good view of his action, for he was standing well in the open, and in the glow of the lava.

A moan from above swelled into a roar. My heart skipped a beat. It was one of those two-ton *inflammite* bombs. The bombs dropped previously were as pills by comparison. That it would burst through that inverse magnetic film of the fan rays by sheer momentum, I had no doubt.

But it didn't. With a horrible whooping shriek, it rebounded to one side and detonated two or three hundred feet away, the shriek and the stunning detonation blending in a vast ear-splitting sound.

The fan-ray film threw off the big steel "can" and its fragments, but it offered no resistance to the force of the explosion. The people of Venus nearest that side of the circle were literally blown from their feet, and lay mangled and bleeding.

There followed a period of silence no less stunning than the explosion. Then the invaders leaped to work. Under snarling, barking commands of their leaders they rushed to replace several of the fan-ray machines that had been blown from their mounts, while the operators of the remainder raised the angles of their beams to make the cone as large as possible.

Fluttering and swinging down through the film came another little parachute message. Their commander did not have to know any Earth language to grasp its meaning. But he did not seem to. Or if he did, no other course than ignoring it entered into his calculations. Again he waved aside the bearer of the message angrily.

The invaders once more were near panic, but their discipline held. Suits and helmets were donned hastily. The coughing guns were manned, and began to hurl their queer suction bombs upward into the black night. These projectiles, I noticed, passed freely through the fan-ray film.

"Hell" From "Heaven"

AROUND the circle machines were hastily manned to drive diagonal wells into the ground. In these the ray machines were placed for safety. The work that was accomplished in the next ten minutes was astounding. The men of Venus were almost ready for the heavy bombardment when it broke, and their suction bombs were flashing with blinding rapidity against the dark sky above. I could well imagine that our air guard were having no picnic with them. Their flashing would have served to half blind a pilot.

Then "hell" dropped from "heaven." One by one, at intervals of less than a second the two-ton bombs fell. They were thrown off at various angles from the cone film, but being set for contact detonation did not rebound to great distances.

I threw myself to the ground, with my arms wrapped around my head, and lay there half stunned. I lost consciousness at the expiration of a short interval. I don't know how long it was before I came to. But as I staggered to my feet, those about me were doing the same. There was no indication of our planes overhead, and the faint iridescence of the cone film was unbroken. Many of the machines sprawled about, overturned and wrecked. And at several spots within the circle I could see parts of our planes which evidently had been wrecked by the coughing guns.

Fully half the original fifteen hundred invaders were now casualties. But the remainder tirelessly took up the task of repairing the damage and carrying on their construction work. And such wonders did they accomplish with their strange machinery that dawn rose on a terraced, castle-like structure of solid and cooled lava, circular, about a thousand feet across, and rising to a squat tower in the

center the top of which was some two hundred feet above the level of the plain.

An encircling ring of fan-ray machines, buried deeply in a diagonally-cut trench, spread their cone-shaped, faintly visible protection above the structure, and far enough away from it to render the explosion even of such bombs as had been hurled during the night relatively harmless.

I was dragged within this fortress, and locked in a bare cell, from which I had a restricted view through a narrow porthole facing the north.

Within my range of vision a few sentries covered from head to foot in their peculiar suits, patrolled the terraces, pausing now and again to gaze through instruments that looked like complicated reflex telescopes mounted on tripods. But the main body must have been within the walls, sleeping off their exhaustion, for aside from the sentries I saw no one. Exhausted myself, I dropped to the hard floor and fell asleep.

CHAPTER III

Unearthly Colonies

A GREAT deal of history was made in the two months I was held prisoner. But I learned little until afterward of the manner in which the invaders, who had peppered the world with colonies similar to the one in which I was incarcerated, finally consolidated their strength in the tropical sections of Central and South America.

Most of their "bulbs" had descended about a thousand miles north or south of the Equator. Several had landed in the United States. Some of these had been overwhelmed at once, when their crews showed fight, and before they could assemble and bring into action their fan-ray machines or their coughing guns and suction bombs. Others had managed for several days to stave off the Air-Guard and Land-Guard cordons which closed around them. One had held out as long as two weeks.

Once their fan rays were in operation they were most difficult to subdue. In each case where the Air-Guard did not succeed in annihilating them at the outset with *inflammite* "pills," they finally had to be overpowered by massed infantry attacks.

In these attacks our Guard suffered tremendous losses, for as they passed through the fan-ray zones their rifles and side arms were wrenched from their grasp by the repelling effect of the inverse magnetic forces. The men were forced to cast aside all equipment containing metal of any description, and to meet the soldiers of Venus with bare hands, rocks, and such hastily improvised clubs as they could get a hold of as they advanced; whereas the planetary invaders, already safe behind their magnetic film, were not handicapped in the use of metal weapons, and their deadly vacuum grenades.

The European divisions of the Caucasian Federation were not, on the whole, so successful as the American in coping with the invaders, while in Asia, and other parts of the world, the invaders had things pretty much their own way.

Later, as they assembled their aircraft, and got their earthly bearings better, they abandoned their outlying lava forts, and mobilized in the tropical regions of the Western Hemisphere, where the weather conditions were more suited to them, and where they achieved such concentration of forces that the most powerful of the hastily organized attacks of the American Air Guard, reinforced from Europe, were decisively repulsed.

Then ensued that lull in hostilities that preceded the final conflict.

But all this is a matter of general history, whereas this account is primarily concerned with my own experiences.

Skins Like Fish

THE first week of my incarceration was rather dull. My jailer was a middle aged man of abnormal cerebral development. Most of the food he brought me turned my stomach; filthy messes of partially decomposed animal and vegetable matter. There were certain vital physiological differences between the men of Venus and those of Earth, and as a matter of fact the fare that was brought me was in full conformity with their standards of wholesomeness and palatability.

My jailer pestered me continuously, forcing me to utter the names of everything he could point out to me or show me pictures of. They had some very clever photographic process that enabled them to take telescopic pictures of great clarity and accuracy.

From the names of objects, he probed me for words denoting action, and so on, until much to my surprise, at the end of no less than a month, he addressed me one day in halting, but unmistakable English.

"Your speech has been very hard to learn," he informed me, "because it is so involved, and much less direct than ours; though it has the advantage that you have fewer words to remember."

This was the gist of his speech. I don't remember the exact words he used, except that they were very funny, and also very ingenious in the association of ideas through which he made his meaning clear.

But after this he did not bring my food any more. Instead a young girl was assigned to the task. She informed me haltingly that she was learning my speech.

"Let me teach you," I suggested. She smiled at this, but shook her head negatively.

"I can learn more quickly from the *miorurlia*," she said.

And at the end of another week she was speaking better English than the man had.

She told me I was considered something of a prize, for though their colonies had captured several thousand Earth men, most of them had rated low in intelligence, and they had only two or three altogether who spoke English.

Her name, she said, was Nyimeurnior. She quizzed me untiringly about life on the Earth, and since her questions covered the entire range of engineering, medicine, sociology, history, commerce and in-

dustry, as well as political economy, I was rather hard put to give satisfactory answers. But in turn she freely discussed her own race with me.

She found it difficult to understand why the food they had been giving me was nauseating to me, and this led to a long discussion of many physiological differences between Earth men and the men of Venus. That there were such differences I was not unprepared to learn, since there were such differences in physical appearance.

On the whole, the invaders were a trifle smaller of stature and bigger of head than ourselves. Their foreheads were higher, their eyes a bit larger, and their noses, mouths and chins, though regular and beautifully molded, a bit smaller in proportion. At that, however, I have seen Earth men who could have passed for these people, were it not for the difference of coloring.

They were as dead white as marble statues, except for tawny yellow eyes and hair. And I might mention that they had no hair anywhere upon their bodies except upon their heads, where it grew thickly. Both men and women wore it cropped very short. This dead white skin of theirs was thicker than ours, but was also very soft, and normally should have been moist, not from perspiration, but from the absorption of moisture from the air. This absorption rather than excretion appeared to be the principal function of their pores.

They could, of course, and actually did, drink a great deal of water during their life on Earth, but the sensation was very unpleasant to them, and they drank only of necessity, because their pores could not absorb from the relatively dry atmosphere of the Earth the amount of water they needed.

Rule or Ruin

THEY needed considerably more heat, also, than our climate furnished anywhere except in the tropics. This was the reason for their decision to withdraw those colonies which, like the one in which I was held prisoner, were located in more temperate regions. It was also the reason why they contemplated no immediate conquest of the Earth, but planned to remain on the defensive in their tropic strongholds until such time as they might better adapt themselves to Earthly conditions, and increase their numbers. In the meantime, however, it was their intention. Nyimeurnior told me, to keep the Earth men busy with destructive air raids.

They had anticipated finding the Earth's atmosphere different from their own, of course, and knowing that it would be considerably drier had equipped themselves with waterproof suits which covered them from head to foot.

These suits served the purpose of humidors. They were also an absolute essential as a protection from the Earthly daylight. Our atmosphere, lacking the fog filters of that of Venus, lets through certain rays of the sun which, though almost a necessity of life to Earth beings, are rank poison to Venus animal and plant life.

"Does the sunlight never break through the cloud layers of Venus?" I asked Nyimeurnior.

"Not ever," she replied, quaintly. "Our daylight is very bright, and very warm, because Venus is so much closer to the Sun than Earth. But the air is very full of water, like the fog you tell me you have in other parts of Earth, and like these clouds that sometimes pass above us here, and it is never you are able to see for greater distances than what you call a quarter of a mile. Before we came to Earth we knew sunlight only from sending—what do you say?—scientific expeditions up through the clouds many, many—that is, a very great distance."

Exposure to sunlight, even for a very short time, was deadly to the people of Venus. I had occasion to observe this for myself later. It did not burn them in the way that over-exposure does Earth men, for they had no pigmentation in their skins whatever. But it did pull the blood right out through the pores, so that after a time they became horrible spectacles. But even more deadly than this was its toxic effect upon them. It deranged their nervous systems, and stimulated them to a hysterical fever, which was quickly followed by a torpor and, if relief measures were not applied promptly, by death.

A half an hour unprotected from the rays of the sun would turn the hardiest man of Venus into a dried-out, blood-caked corpse. An hour or two hours in normal daylight, out of the direct rays of the sun would do the same, though they suffered little discomfort in going abroad when it was storming or the skies were heavily overcast.

Naturally they were not happy in the Earth atmosphere. Nyimeurnior told me that they wore very little clothing on Venus, and hated the feel of the humidor suits they were forced to wear out of doors in the daytime on Earth. But there was no help for that. They simply kept under cover all they could during the day, in their artificially humidified structures, adopting a schedule of night work. But even at this, the chill of the night outdoors was playing havoc with the health of the community, and before many more days, she informed me, they would abandon the lava fort, and migrate in the airships they had built since my incarceration to the city which other communities were even now completing in the fastnesses of the tropical forests of Brazil.

"I cannot understand, Nyimeurnior," I said one day, "why your people refused all overtures of peace. Our Earth nations are not bloodthirsty. We do not kill for the sake of killing. There have been many wars in the past, owing to the fact that men cannot always agree on everything, but in the main Earth men live at peace with one another, and I know they would be willing to live at peace with your people if you would show the right spirit. There is much in which we could help you, much that we could teach you; as there is much that we could learn from you. It would be to the mutual advantage of both races."

The girl looked at me queerly. Her pretty little mouth closed in a grim line. She made no reply whatever, but arose and left my cell immediately, evidently in anger.

I never thoroughly understood this attitude on their part; nor have I ever heard that any one else ever did. During the time I was prisoner I tried to suggest the idea of a truce to their leaders as frequently as I could. But it seemed as though their consciousness was utterly and mysteriously barred to its consideration. The only reply I ever got was a blow in the face, or a look betokening a suspicion that I was mentally unbalanced. Don't ask me why. I can't explain it. But certain it is that, from the day the first bulb fell into our atmosphere until that final day when our armies, millions strong, surged irresistibly through the Brazilian forests, not once did they make an overture of peace, or indicate, that they would accept any mercy from us. They simply could not grasp the idea, that was all.

For several days after I made this suggestion to Nyimeurnior she would not speak to me. She brought my food (healthful Earth food now, not the sickly messes they had given me at first), and left as quickly as possible. It was as though I had offered her some gross personal insult that had filled her with a loathing of me.

Mushroom Ships

THIS didn't bother me much, however. To those who had any personal contact with the invaders, I don't have to explain why. But, for the benefit of those who never saw one at close range, I might say that though I found the girl interesting, and though I could even go so far as to refer to her as "pretty," anything like a romantic interest in her was an utter impossibility.

Imagine, if you can, being in love with a girl with a dead-white, moist, clammy skin, like the belly of a scaleless fish, bloodless lips, and smoky, yellow eyes that somehow reminded you of those of a cat, although the shape of the eyelids was human enough.

No. Nyimeurnior's attitude did not disturb my emotions in the least, though it piqued my curiosity greatly.

Gradually, however, she appeared to forget the "insult." Her interest in information about the Earth served to renew our conversations. Perhaps she was ordered to resume them.

She told me about their airships, mushroom-like affairs in which the space for the crew and cargo corresponded with the stem, and the elevating machinery is built into the umbrella-like superstructure. They could rise in a straight vertical line, like helicopters, move slowly and gently, or hover motionless. Speedy aircraft, she explained, would be suicidal in the fogs of Venus.

I was amazed at her description of the manner in which they were supported. Air on the upper surface of the "umbrella" was destroyed by electronic action, thus forming an up-sucking vacuum. It was "recreated" electronically on the under surface of the umbrella, thus forming a supporting cushion of compressed air which, though constantly dissipating, was being replenished with equal rapidity. It was only necessary to vary the speed of the process to rise or fall. Automatic compensators constantly adjusted the vacuum and pressure at various points on the umbrella surface, always keeping the ship in perfect balance. If anything went wrong with the electronic apparatus the ship merely came down like an ordinary parachute. Horizontal propellers furnished motive power.

With the clear air of Earth through which to fly, she said, their engineers were increasing the ratio of motive power, and her own community had succeeded in obtaining a speed of 130 miles an hour with its ships. This was less than half the speed of our Air Guard patrol planes, and less than three-quarters that of our bombers.

"We are saving you to teach us about planes," Nyimeurnior said.

"Saving me from what?" I asked.

She looked at me in surprise. "From death, of course," she replied. "Why should we be wasting food and trouble on you if we could not make use of you?"

"Would you not spare my life from motives of mercy?" I asked.

"'Mercy?'" she repeated questioningly in her peculiar pronunciation, "that is a word we have not spoken of before. What does it mean?"

I tried to explain to her, but quite unsuccessfully. The best she could make of the idea of sparing an enemy of whom no profitable use could be made was that it was a manifestation of ignorance or insanity. I began to realize that these people had no conception of charity, sympathy or kindness as spontaneous emotions, although they approximated the practical manifestations of the emotions from a motivation of expediency.

I delved further, and found that they were unfamiliar with love, except as an intellectually selfish emotion. A husband was kind to his wife, for instance, because he needed her help and cooperation, and realized that she could give this more efficiently under the influence of consideration and comforts than with a mind or body deranged by harsh treatment. If she lost her usefulness to him he put her away on a sort of pension arrangement. He did not kill her because that would make other women fear him, and he might have difficulty in getting another wife. On the other hand a wife was helpful and considerate of her husband because she realized it was to her interest to cooperate fully with him.

And naturally, the most kind and considerate of the young men and young women were in the greatest demand as husbands and wives.

But back of all their courtesy and consideration was nothing but an acutely developed self interest, tied up with a peculiarly keen appreciation of the values of cooperation, and an ability to weigh and balance those values, undisturbed by emotion, far

in advance of any similar ability on the part of Earth men.

They had only one true emotion—physical fear. They were very susceptible to it. As compensation they had a high order of intellectual courage. The fact that they had risked a journey through space attested that. But their physical susceptibility to fear in moments of emergency was a far greater handicap to their balance and judgment than is the case with the average of Earth men. Fear tended to paralyze rather than stimulate them to action. Intellectually they steeled themselves from early childhood against this weekness, but with only partial success.

It was quite plain to me as a result of this partial insight into their psychology gained from Nyimeurnior, that I had my choice of ultimate death, or playing traitor to my country, my world and my fellow man by teaching them to make and fly airplanes.

For strange as it may seem at first thought, Earth men, despite the comparative newness of their mechanical civilization, held an advantage in the air, from a military point of view, with their swift, darting planes; though it may be conceded that for general convenience and comfort the Venus "umbrella ship" was superior.

Having developed their navigation of the air along totally different lines for centuries, the newcomers had nothing more than an elementary grasp of the principles underlying the construction and use of planes.

CHAPTER IV

The Judgment of the Nyapacleur

I HAD no intention however, of either turning traitor or sacrificing my life. So I began to maneuver for a chance at freedom.

Not long after I had come to this conclusion I was take before the *Nyapacleur* or commander of the community, whose position, with allowance made for the highly organized and mechanically perfected civilization of Venus, was not unlike that of a feudal baron. That is to say, he held the power of life and death over the entire community. The members, according to the Venus theory, owed all their necessities and comforts, as well as their very lives, to the skill and strength of his leadership. They, in turn owed those lives to him if ever he should choose to call for them.

This *Nyapacleur's* name was Lourmon. He was the same before whom I had been taken for a brief instant in the sphere which had brought the community from Venus. Nyimeurnior and my first jailer, whose name I learned was Founyi, acted as interpreters.

The room in which he gave me audience was not unlike an office. He sat at a kind of desk, on which, however, the usual mass of papers was replaced by a number of mechanical contrivances which I judged were various forms of recording and reporting devices.

The air in the room was warm, and highly humid. Lourmon, naked except for the peculiar belt and shorts the invaders wore, and a kind of sandal, was such an incongruous figure, from my Earthly point of view, that I could not help smiling. Imagine, if you can, a near Grecian statue come to life and leaning carelessly over a table piled with modern scientific instruments.

He glanced at me keenly, and spoke a few words in that soft, slurring tongue of theirs which was a form of language which no race on Earth has yet developed except for purposes of writing. By that I mean that it was not the original or natural speech of these people, but a species of "shorthand," through which entire sentences and paragraphs might be summed up in a single word, or two or three words. One of my great regrets is that I had so little opportunity to learn it.

These few words Founyi translated into nearly five minutes of his slow English, reviewing in detail the account of my capture, referring more briefly to the journey of the invaders through space and the reasons which led them to attempt it, outlining their determination and confidence in their ability to exterminate Earth men and take over the world for themselves, and setting forth my individual helplessness and the wisdom of endeavoring to make myself a useful slave if I desired to preserve my life.

While Founyi was translating, Lourmon, clearly impatient at the handicaps of such a slow and clumsy language, was abstractedly manipulating the levers of a little apparatus which was presenting to him a series of pictures on a little translucent screen. At the end of Founyi's speech he looked questioningly at me, as though taking my consent for granted.

I had decided to appear to agree, for only in such a source could I see any possibility of being permitted enough freedom of movement to plan for my escape. But I did not want to seem to give in too readily. It would be more convincing, I thought, if I were persuaded only reluctantly, after more elaborate threats and promises. In this, however, I made a blunder.

Lourmon leaped to his feet in a rage when I did not instantly agree.

"M'yarrip!" He fairly snarled the word at me.

"He says," Nyimeurnior explained calmly, "that you are a fool, but that since you are only an Earth man he will give you one more chance to think it over and make better use of what little intelligence you have. He does this, not from any motive of 'mercy' or justice to you, for as a prisoner you are not entitled to any rights or claims whatever, but on the contrary are indebted to him already for several weeks' existence. He does it merely because he needs information you can give him, and he is willing to sacrifice even his dignity on the chance that you will ultimately give it to him freely. But this sacrifice of dignity in not ordering your execution immediately he will hold against you as a debt. If you do not change your mind you will be tor-

tured, and the secrets of the Earth airplanes dragged from you."

I was so amazed at the volume of meaning the girl translated from the Nyapacleur's single word, that I forgot to play my rôle, and instead of consenting at once, stood there with an open mouth, like the fool Lourmon had called me, trying to figure out how much language actually had been packed into two syllables, and how much was, so to speak, "embroidery", added to it by the girl from her knowledge of the situation.

Lourmon made a vicious little gesture, and my two interpreters led me back to my cell.

"You're not such a low mentality as he believes you," the girl remarked. "Unless I too have misjudged you, you will accept. If you decide to before the next mealtime, just knock on the panel. The guard outside will be instructed to take you to Lourmon, who will not need any speech from you but just a sign of assent." With that she stepped from my cell to the corridor and shot the panel [illegible]

Escape

THIS arrangement, I thought, would give me my opportunity. I glanced through the tiny window of my cell. A brilliant morning sun flooded the half mile or so of bare plain and the rugged, rocky country beyond. Why should I wait to build up little by little any elaborate plan of gaining more and more freedom of movement within the "castle" until finally I could make an opportunity of escape? It would be better to risk all on a bold stroke.

After the first day the sentries had given up patrolling the open terraces in the daytime, even in their cleverly constructed humidor suits. Two of them had died from it. Instead, I had been informed by Nyimeurnior, they were safely ensconced in little turrets, which they could enter only from within the fortress, and from these they scanned the sky with their telescopic instruments, carefully shielded with ray filters, for signs of the Earth men's airplanes, turning their attention occasionally to the rough country surrounding the little plain on which the fortress was located.

Once I got clear in the open sunlight, the invaders would certainly find it difficult to pursue me. My danger would be chiefly that they might launch an umbrella ship after me.

Indecision is not a frequent fault among us of the Air Guard. I rapped on the door at once, hoping that my guard would be a big fellow for his race, and be wearing his humidor suit.

Footsteps approached, and the panel swung back. He thrust his head in the cell and beckoned me to follow him.

I seized and jerked him into the room. It would have been easy to knock him out with a blow on the jaw if it had not been for his helmet. But I finally managed to knock this off as we scuffled and then a few well directed blows put him out.

I stripped the fellow of his humidor suit. Luck was with me, for though he was not as large as I, his suit was a bit large for him, and with some difficulty I was able to squeeze into it. Placing the helmet over my head, I belted on his weapons, which consisted of a short sword and a couple of what I took to be small vacuum grenades. Then I stepped boldly through the panel door into the passageway. Nobody was in sight.

From a distance, some place below, there came to me through the network of corridors and up the ramps which was used in place of stairs, the sounds of a large body of men marching. Gradually this sound lessened, and since at the same time I heard a confused clamor through the outlet ventilators, I judged that a detail of men had been sent outside the castle.

This was strange, for it was broad daylight, and the sun was shining brightly. I knew that something important must be afoot to take the soldiers of Venus out into the sun, even with the protection of their humidor suits and helmets. After some search through the deserted upper levels of the structure, I found a lookout turret from which I could get a good view of the surrounding plain.

It was a typical view of that section of Mexico; a broad plain quivering in the sunlight, for the most part arid and bare, but with occasional islands of rocky protuberances and patches of poverty-stricken mesquite.

Far to the West, at a point which was practically the limit of my vision, I saw another of the lava fortresses. The sky above it was filled with little flashes of light, and puffs of smoke, indicating that an attack was being made upon it. As I gazed a giant dirigible of the Air Guard, in its low-visibility war paint, swung broadside on to my line of vision, materializing, as it were, out of an empty sky.

There followed a series of detonations so heavy that I could actually feel the air vibrate. But apparently not even these heavy bombs could break through the fan-ray film which the invaders had spread above themselves. The little flashes and smoke puffs continued both aloft and below.

I glanced downward at the gate of the fortress, which I might mention here was not unlike that of a medieval castle, if you can imagine one of those old European fortresses done over again in modern factory construction style.

A column of soldiers had issued forth, and was winding its way across the plain in the direction of the beleaguered fortress. But what interested me most keenly about the column was the method used of protecting it from air attack. In the center marched a column of infantry. To either side of them a column of fan-ray machines, which lumbered along on lever-like legs, with a motion not unlike the lurching of our own tanks, their generators all turned outward, spreading a fan of rays, almost horizontal, over the tops of still two other flanking columns of machines. These outside columns played their rays upward and inward over the center

of the column, the two films of rays crossing and furnishing complete protection.

The only way in which that column could be reached by steel projectiles of any description was from the ground, at flat trajectory.

So interested did I become in the attack on the column which I was certain would follow, that I forgot the pressing need of making my escape, and stood there gazing.

From somewhere behind and above there came a steady hissing roar. Four Venus airships came into view, taking up their positions to the rear of the column at a height of about a half mile. Nyimeurnior had described these ships to me, but this was the first I had seen of them. They were upright cylinders, some fifty feet in height, and about thirty feet in diameter, crowned by an umbrella-like structure a hundred feet in diameter, and several feet thick. It was from the top surface that the air was being "electronized" into vacuum, to be rematerialized on the concave under surface.

If it were not for the light projecting and bracing steel beams which helped to hold the affairs rigid, and also provided landing gear which would not offer the same resistance to the air as a solid platform, the things would have looked like giant floating mushrooms.

They too, floated in what was practically an envelope of inverse magnetic rays, the generators being so placed as to cause the beams or rays to cross in every direction. They hung in the air above the column, calmly awaiting the swooping attack of our Air Guard.

When it came it was sudden enough. Seven squadrons of planes dove head-on at the Venus ships, spitting a steady hail of projectiles, zooming successively when they had almost reached the fan-ray film.

But it did no good. The projectiles bounced off that nearly invisible film like rubber balls from a concrete wall.

A Fruitless Attack

I WANTED to shout at them to use non-metallic projectiles, to which I knew these rays would offer no resistance, but of course it was ridiculous to suppose they could hear me. As a matter of fact I could not even signal them, for I was shut up in the lookout turret.

It was the frantic desire to get this information to my own side which finally prompted me to tear myself away from my point of vantage. Even as I did so I saw one of our planes collide with the magnetic wall, and hurtle down, a crumpled thing; while another caught within the effective radius of one of the suction bombs, also crumpled and fell.

Leaving the lookout turret I hurried down through the corridors and ramps with little fear that my disguise would be penetrated; soldiers I encountered several times. I had learned much of the manners, customs and courtesies of these people from Nyimeurnior, and gloved and helmeted as I was, I was covered from head to foot. Nothing but the most searching gaze through my helmet goggles would have revealed the fact that I did not have a dead white skin.

At last I reached the passage through which the column had passed but a short time before. There was a sentry on guard just inside the big gate, which still was open, but he was gazing out after the departing column. I simply elbowed him aside and trotted out over the plain as though I were a tardy member of the expedition, hurrying to catch up to the column. I stole a glance back over my shoulder. The plan had worked. He had not been alarmed by my action.

I was careful, however, not to catch up to the column, but bore off toward the North when I was sure no attention was being paid to me. Then I removed the helmet, and stripped off the humidor suit, which was a great relief. I think that a half an hour longer in that moisture proof garb, under the blazing Mexican sun, would have drowned or smothered me in my own perspiration.

From somewhere to the Northwest an artillery barrage was laid down on the invaders' column. For a moment I had a thrill of elation. From the confusion it produced I thought it had succeeded in crashing through the magnetic wall. But it had not. There was the usual result, shells bouncing harmlessly off and exploding in the air above the column. The confusion evidently was produced by the surprise of the bombardment and the noise, for the battery was a long distance away, and well hidden.

For a while the column halted, and the men cowered. But few seemed to take any real alarm. In the end the machines resumed their sluggish progress, while the infantry staggered and crouched their way forward, quite safe from the explosions above them, but far from enjoying it.

Farther on, the column was ambushed by a detachment of our infantry. Simultaneously another attack was launched on it from the air. But no success attended the efforts of the Earth men.

A number of the Venus ray generators were raised on extension platforms and the direction of the rays depressed. And I could see that not even a flat trajectory fire could reach the column. As the climax of the attack the planes above withheld their fire, and the Ground Guard threw three waves of infantry against the column, but only to wither away under the suction bombs of the coughing guns with which the Venusians met them. The Earth forces withdrew at last, after suffering considerable loss, and the men of the column, probably with frazzled nerves, but with little physical damage, continued to wend their tortuous, painful way across the plain, and entered the other fortress.

All this time I had been making my way Northward, until finally I passed out of sight of the two castles. That night I built a code signal fire, and inside half an hour was picked up by a high-angle plane which dropped down beside me.

CHAPTER V

The Great Retreat

AS a result of radio orders I was sent to Washington at once to report to the Ordnance Board. The knowledge I had gained of the invaders, their methods and their machines proved invaluable. Not that the Air and Land Guard General Boards had not already determined the fact that special projectiles and equipment would be necessary to penetrate the defensive rays of the invaders; but I was able to verify many of their conclusions, correct certain others, and generally expand the fund of knowledge that already had been gathered by the Intelligence Division.

I had a busy two weeks hopping from one office to another on special detail, and events moved swiftly in those two weeks. I was myself amazed at the speed with which new guns and new non-metallic shells and bombs were being turned out, and the ingenuity shown by the scientific departments of the Guard and by manufacturers in developing a non-metallic bayonet.

Troops had to be equipped with canteens, belt buckles, head gear, and buttons and fastenings on their uniforms which had no metal in their construction. The rifle, it was determined, could not be abandoned, but non-metallic cartridges were developed. The theory was that in passing through the magnetic film of the Venusians for hand-to-hand fighting the troops would drop their rifles, and use the detached sword-bayoneta.

Naturally these things could not be produced overnight, nor could the troops be trained in new tactics overnight, but so intensively was the work of manufacturing and drilling prosecuted that at the end of two weeks many regiments of the Land Guard had been reorganized, and about a tenth of the Air Guard had been supplied with non-metallic bombs.

During this period, however, the two fortresses with which I had been concerned were abandoned, their communities drifting laxily and safely Southward in their mushroom ships, as did many others, finally settling in the interior of Brazil.

Perhaps I should pause here to summarize the sequence of events up to this point.

Nearly two weeks elapsed between the arrivals of the first and last of the bulbs. Seventy-two of them landed in the United States, 11 in Canada, 3 in Scandinavia, 1 in England, 27 in France, 81 in Germany, 19 in Italy, 107 in the Balkans, and hundreds in the tropic belt all the way around the Earth.

Throughout Western Europe the League's land and air forces got into relatively quick action against them. As fast as new spheres descended they were walled in by rings of troops, and roofed over, as it were, by clouds of aircraft. The one which fell in England was destroyed after two days. In France nine were successfully bombed before they could get their inverse magnetic rays into operation. The crews of the others managed, under fire, to erect their fortresses, but were so worn out by the never-ending bombardments to which they were subjected, that they were finally overcome by the charging waves of infantry who had been armed with wooden clubs and short spears. Twelve communities fled Southward in their air ships, but ran into atmospheric conditions that were horrible to them in Northern Africa, where the lack of humidity caused them terrible losses.

Of the hundreds that landed in Africa, the majority perished. The remainder made their way either Eastward or Westward around the Equator to the fastnesses of the Brazilian jungles, where they constructed their great stronghold.

At the end of three months none of the invaders remained anywhere in the civilized sections of the temperate zones. The story of those invaders who established themselves in such lands as Tibet and Siam, and how they ultimately perished, has not all been unearthed yet from the ruins.

Fifty-seven of the colonies that fell in the United States were destroyed. The others fought their way through our air forces toward the Tropics.

Then there ensued a period of two months in which the invaders and Earth men were content to let matters rest while they took stock of the situation and prepared for the greater struggle to come.

The men of Venus did very little of the raiding they had intended, according to the plans Nyimeurnior had explained to me during my incarceration. Time and again our air fleets coursed over the Brazilian forests, but seldom did they find evidence of the enemy's works. The invaders had learned well to conceal themselves under the leafy protection of the jungle. They had learned too, to raise no lava fortresses where they could be seen from above, and also to conceal the flow of their volcanic wells.

They had little chance of meeting us successfully in the air now, for our air fleets had been given bullets and projectiles of non-metallic construction, against which the fan-rays of the invaders were of no avail, and it became more a matter of sport than anything else among us of the Air Guard to sight a mushroom ship, or squadron, and shoot it down. Their suction bombs were destructive, but we could move too fast for their ships and outclimb them easily.

However, according to the best estimates, there were close to one million of them now established in the Brazil jungles, where they were busily readjusting themselves to Earth conditions, constructing their ingenious machines and developing their resources in preparation for a future outbreak which we all feared would be far more devastating than the effects of their haphazard and uncoordinated activities at the time of their arrival upon Earth.

The paucity of information on their movements in the jungle was ominous. Terror-stricken Indians staggered into the Brazilian military outposts with tales of wholesale and mysterious slaughter, of mists that travelled purposefully through the jungles, from which ghost-men emerged to slay.

Brazilian military reconnoitering parties went out and failed to return. Once a mist cloud moved out of the jungle and enveloped an outpost. When it retreated, according to the story of a soldier who had been outside the lines, the entire garrison had been massacred.

Yet these mists were never observed above the tree tops.

The Earth Mobilizes

THE Brazilian Government had made its formal appeal to the League for help, according to the League Constitution, and a gigantic army, recruited from all the nations in the League, was to surround the vast jungle territory.

Ten million men were to be used, for though they would be opposing only about a million of the enemy, they would be fighting for nothing less than the existence of the human race, and would be facing the unknown.

This was the general situation. And while this immense army was being mobilized and equipped, a call was made for volunteers who had had contact with the enemy, to attempt the highly dangerous work of penetrating the Brazilian forests as scouts and spies. And I, having no better sense, volunteered.

That was why I found myself ensconced one night in the upper branches of a tree far in the interior, in a section where I had finally found evidences of activity. I wore an imitation "humidor suit", that was an imitation only in its clever arrangement for ventilation. It was in fact, a real Venus garment which for the moment was suspended on my chest like an old-fashioned gas mask, but was in reality, a gas mask, and several other things besides. In my hands I held a little box, a tiny radio broadcasting set. Scattered around me through the forest at strategic points, were carefully concealed bombs and flares, each tuned so that by pressing the proper button on the box I might set off any particular bomb or flare by radio impuse. I had spent the day planting these mines, among which were a a number of gas bombs.

All these arrangements were precautions of self defense. I had no intention of carrying on a campaign single-handed. But I had picked the spot for several days patient observation, for it was here that I had noted several fresh trails that appeared to my unwoodsmanlike eye to converge and come to an end for no reason whatever in a little clearing not far from the tree in which I was hiding. A quarter of a mile away, carefully hidden, I had one of our new helicopters, developed by the Air Guard, a machine that was powerful and as nearly silent in its operation as any device using an air propeller could be, and far beyond sight a great dirigible was awaiting my communications.

But since nothing at all happened that night, and no sounds came to my straining ears except those of the normal animal life of the jungle, I determined the next night to try an experiment.

I waited until after midnight, and then pressed a button on my radio control box which resulted in a terrific explosion about a quarter of a mile farther on in the jungle. I got the flash of it even through the dense growth of the jungle, and my tree trembled with the force of the detonation.

Immediately there was a series of purplish flashes in the sky above that spot, which merged into a continuous mass of pulsating lights, as the preliminary thunderclaps grew into a continuous roar. My experiment had proved profitable. I had learned something. I knew those flashes and thunderclaps as the product of the "coughing" guns of the enemy. But the power of this barrage exceeded by far anything I had seen while a prisoner among them. As suddenly as the uproar had begun it ceased. And silence once more settled over the jungle.

It was evident that I had stumbled into the neighborhood of a Venus artillery post, and no mean one. My bomb had been mistaken for one dropped from an airplane. The next day I searched for the location of that battery, but could not find it.

The night following I slept, but devoted the day after that to another painstaking search of the jungle. At last I found a spot where the foliage of the trees above me appeared to have been shredded and torn. I searched the ground carefully. My patience was rewarded by the discovery of a beautifully designed camouflage, a screen of moss and leaves which concealed a pit. The battery was buried under ground, and fortunately for me, must have been unmanned and unguarded at the moment, although this did not surprise me, knowing as I did how the invaders hated our atmosphere in the daylight, even when wearing their humidor suits.

The gun crew, I was sure, was also somewhere below ground, probably sleeping, and the sentry, who must have had some post of vantage from which he could see the sky, was evidently so placed that he could not observe the floor of the forest.

As quietly as I could, and I must admit, with some fear, I slipped away to where one of my bombs was concealed, and carried it carefully to the pit, where I concealed it in some undergrowth nearby. That night I took up a new post in a tree from which I could see the mouth of the pit and detonated another of my bombs some distance away.

The phenomena of several nights before was repeated in the air, but I did not watch it this time. I kept my attention centered upon the mouth of the pit. The screen had been blown aside, and so fast was the buried gun firing (it seemed to be only one) that its discharges blended into a continuous, faintly luminescent column that tore through the upper branches of the trees.

After a bit the gun ceased firing. About a quarter of an hour elapsed. Then a faint light appeared near the mouth of the pit, by which I could observe the figures of a half a dozen invaders. Two of them were naked-white in the soft, warm tropical night, but the others wore their suits and helmets.

One of them was placing a new screen over the

mouth of the gun pit. Others were carefully gathering up the debris torn from the trees above.

My first instinct was to slip to the ground and creep up on them. I felt that in the darkness it would not be noticed that there was an additional member of their party, and I might be able to follow them underground. But caution prevailed and I determined first to communicate my discoveries to the dirigible somewhere in the sky above.

We had planned an ingenious method of doing this. With the first grey light of dawn I felt my way back through the jungle to the spot where I had left my helicopter, for my radio would not have been powerful enough to reach the ship, nor would I have dared to use one for a continuous message. The enemy might have picked it up and located me. The small amount of power, and mere instantaneous spark that I used to detonate my bombs did not matter.

From one of the compartments of the helicopter I took a tiny model of the same sort, equipped with a little chemical engine. The whole thing was little bigger than a cigar box. I wrote my report and attached it to the model, which I shot vertically into the air. When it was five thousand feet up, it would automatically broadcast a range finding signal, and emit a faint smoke trail, which would enable one of our planes to pick it up. It would rise under its power for many hours, then drift down on a little parachute, and finally, if not picked up by the time it drifted below the 5,000-foot level, it would burn, destroying the message.

Into the Tunnel

I SLEPT the rest of the day, for I expected to be very busy that night. After nightfall I returned to my post near the gun pit, but did not climb the tree. Instead I hid behind its vast trunk, and pressed the button that would detonate the bomb I had placed near the gun pit.

It blew a great gash in the ground, and must have put the gun out of commission, for no roaring barrage followed, but a short time afterward ten or twelve soldiers broke through a screen of creepers, and by the faint light of hand lamps excitedly inspected the crater my bomb had torn at the edge of their gun pit. They jabbered laconically in their strange "shorthand" tongue, frequently pointing upward.

I circled and came up behind them, joining their party, yet not getting too close to the others as I made a pretense of searching the ground, and looking fearfully up toward the sky, where only a couple of stars were visible through the dense foliage. After a bit their leader, a man bigger than the rest, who had not donned his humidor suit, grunted a command, and one by one they disappeared through the screen of creeping vines.

I approached with the rest, but hung back a bit, hoping the commander would go in ahead of me. But he did not, and in the end he grunted an angry command. He must have become suspicious as I passed him. Possibly he had been counting, and realized that he had an extra man. At any event, he reached out and grasped my arm.

But I was on the alert for such a danger. Twisting quickly I drove my fist against his unprotected jaw, and he went down like a log. And pushing my way through the screen I found myself in a cleverly concealed passageway which slanted down below the ground level. Following the lights of the others around a couple of turns I came upon a section of corridor that was dimly lighted. After a bit we came to a junction of several corridors, and the men turned sharply to the left down a small tunnel. I paused a moment to take stock of this structure and if possible get my bearings. My little compass made several things clear.

The tunnel the men had followed evidently led back to the gun pit. A main corridor, much larger, stretched away in a great curve to the South. Another curved gently Northward. And toward the West a third one, larger than any of the others, slanted downward at a sharp angle. In the big chamber where these corridors came together—which incidentally reminded much of one of our old subway stations in New York—were a number of big, complicated pieces of machinery. They were not in operation at the moment, however. From down the big West shaft came a distant murmur, which little by little grew in intensity, until I finally thought it advisable to seek cover. I hid behind one of the machines.

The murmur grew into a roar. The roar increased. And there shot out of the tunnel into the big "station", where it came to an easy but quick stop, a great projectile-like car. It had no wheels, but apparently rode on two systems of magnetic devices, one running like a spine along the top, the other like a keel along the bottom.

As I noticed this, the car settled down a few inches, and rested with a bump on the lava-like floor. Several doors in the side opened, and a stream of soldiers began to troop out. At the same moment several of the gun crew came running out of the small corridor. They made their way immediately to the commanding officer of the newcomers, evidently a man of high rank, from the breadth of the belt he wore and the numerous insignia appearing on it, and made their report in some excitement. They knew by now, of course, that their battery commander was missing.

He replied angrily. I gathered from his impatient gestures that he was reprimanding them for not returning to the jungle to seek their officer. And I realized I was facing a crisis.

But I dared not come from behind the machine to join the throng at this juncture, for none of them was in a humidor suit, and I would have attracted unwelcome attention instantly. I was forced therefore, to watch the squad which rushed off at once toward the exit to the forest, and see my retreat cut off.

It struck me that, strategically speaking, it was high time for a diversion if, on finding their commander outside, they were not to start an imme-

diate search of the tunnels. So I drew my radio detonator out and pressed one of its buttons, then another, and finally a third.

There was only one explosion, which came to my ears faintly and muffled from a point some three hundred yards away in the forest. The other two bombs would make no noise. One was a smoke bomb which would so smother their hand lamps that they would hardly be able to see their hands before their faces. The third was a gas bomb, and would give those who breathed its fumes something new to think about, I hoped, for as long as they were able to think.

As I expected, a detachment of only twelve men or so was sent out to investigate. Another detachment, armed with tools and implements of various descriptions, ran down the corridor toward the gun pit, and soon the sound of their apparatus was clanging in my ears. A party from the gun pit came back, and after reporting to the commander, who was pacing up and down impatiently, ran to one of the machines near that behind which I was hiding.

They swarmed over it, manipulating little wheels and levers. And to my surprise the mass of machinery, which reminded me something of a small newspaper printing press, lumbered to lever-like feet, and shambled away down the tunnel to the pit.

Every few moments the commander glanced impatiently toward the forest-exit corridor. Finally he motioned to one of the girls in the ranks behind him (for as I mentioned before, they seemed to make no distinction as to sex when it came to labor or military service) and she ran off toward the exit. But she did not return. Nor did any of the others. I opined that my gas was working nicely, and now bitterly regretted that I had failed to fill my pouch with gas grenades from my helicopter.

At last the officer barked an order. The rest of the soldiers broke ranks, unstrapped their humidor suits from their belts and donned them. Another order and they all moved briskly away toward the exit, trailing their short spears. I slipped into the rearmost ranks and went along with them, for my purpose now was to regain my helicopter, and send up another message to the dirigible, explaining what I had seen of their corridors, and system of underground structures.

CHAPTER VI

Guerilla Warfare

THE head of the column passed out through the screen of creepers. Others followed. Then suddenly the column recoiled. Some of those nearest the screen sank down gasping and choking. Others staggered and leaned against the walls.

Through the confusion I could see that some of them had torn away the foliage of the screen, revealing the piled up bodies beyond. At this moment a gust of wind sent a billow of the black smoke surging into the corridor. The rest of the column turned and fled from it, crowding back down the corridor.

I chuckled as I crouched to let them pass, my gas mask in place, for I remembered the rumors that had reached us of these people leaping from white fogs that roamed the surface of the jungle. The black fog and deadly gases of Earth laboratories were reversing the terror.

As the last of the fleeing enemy disappeared around the bend in the corridor, I arose and made my way to the outer blackness, where I stumbled around for more than an hour before I won free from my own black fog and gas, and located my helicopter.

At dawn I shot another baby "heli" up with my report, and filled my pouches with gas and smoke grenades. I wanted to return and get a more comprehensive idea of the extent of their corridor systems, for I was convinced by now that the whole invader's population had taken to burrowing into the Earth. In digging their volcanic shafts it would be no impossible task for them to adapt their wonderful machines for fashioning the lava product into underground corridors and chambers instead of the castles or fortresses they had first built above ground. If this were the case, our armies were going to have some little task ahead of them in digging them out.

I did not have an opportunity to pursue my investigations further at that time, however, for I had hardly turned from my helicopter when I became conscious of the slight, continuous buzz in my radio box that was the prearranged signal ordering my return to the dirigible.

So, regretfully I climbed into the machine, started the motor, and opening the throttle, roared up through the tree tops. Before I had gone far I was sighted by the enemy, and auction bombs began to burst around me. Stunned by the thunderclap of one of these, I lost consciousness, not to awake until several hours later in one of the bunks of the dirigible.

For several weeks thereafter, all I saw of the war was from the air. I was attached to D-27, one of the new super-dirigibles, as a plane scout. The D-27 was one of the first of those dirigibles that kept permanently to the air, and docked only at infrequent periods, as the battleships of old took to their dry docks only for repairs. The big ship cruised above the utmost range of the coughing guns, and most of the time was unable to see the surface of the ground owing to atmospheric conditions.

A regular patrol was maintained, however. I and fifteen other pilots would catapult our planes down out of the big outlet port in the ship's lower hull, drop like stones to the point of visibility, and then cruise our beats, climbing again to land gently on the great top deck of the ship.

It was in reality dull work. We saw little below with our own eyes but the endless stretch of the tropic forest. But we kept our cameras grinding, and the subsequent development and comparison

of our films revealed much to the staff that could not have been gathered by haphazard visual observation.

These films, for instance, showed at times where new Venus batteries had been expertly camouflaged below the floor of the forest. Two-ton *inflammite* "eggs", in their new non-metallic casings worked marvellous changes in the topography at such spots, and must have permanently discouraged all nearby invaders.

Still, we didn't get any too many of the batteries. Suction bombs climbed up toward us all too frequently from unspotted guns. It became obvious that we could not destroy the enemy from the air without blowing an impossibly large section of Brazil off the map, and that the enemy had no intention of coming up into the air to meet us.

There was but one alternative. The ground army would have to close in on them from the sides, and probably dig down as it went.

The Ring Closes In

I WAS fortunate enough to be the observer of a number of actions when finally the ring began to tighten. The description of one serves for nearly all of them.

It opened with the innumerable flashes and concussions of divisional artillery over a sector probably five miles wide and ten deep. These flashes were but faintly visible from my extreme height. More vivid was the seething, churning, flaming forest where the shells fell. Somewhere on the edge of this churning area was our first infantry line.

Then the barrage ceased and I dived for a closer view and a better opportunity to cooperate.

Like a swarm of ants I could see our men penetrating, painfully and slowly it seemed, into the devastated sector.

Then at several spots, in front and behind the writhing, advancing line, little clouds of white mist puffed out from openings that "bubbled" up in the churned area as though made by tiny moles. These clouds expanded. Then they began to move in definitely controlled directions. The invaders must have had some form of magnetic control with which they dragged these enveloping mists around with them.

Some enveloped sections of our first line, and from my position in the air I could see the broken ends of the lines at such spots pivot back into new positions, to prevent a rolling up of the flanks.

Two or three of the ground-mist clouds suddenly evaporated, uncovering enemy detachments of from 100 to 200 men. One was caught between a cross fire of two machine-gun companies and wiped out in a trice. Another was equipped with fan-ray machines, but the invaders quickly abandoned these when they found they were not stopping the new non-metallic bullets of the Earth forces.

One cloud, I noticed, suddenly became motionless, a great dome of mist about 100 yards in diameter, swaying under the pressure of the gentle breeze as though it were a half-filled balloon. And it stayed motionless. A spotting plane swooped low over it, and zoomed for a little radio chat with its battery. An instant later a veritable hail of shrapnel tore thrugh the intangible mass, but apparently without affecting it. Then from a nearby ridge one of our gas details liberated a great billowing cloud of smudgy vapor that rolled down on it like a tidal wave. The vapor flowed around, over, and even through it, but the misty-white, swaying dome still showed.

I saw shadowy, grotesquely masked infantry pick its way down the slope from the ridge, and with cautious, yet alert decision, plunge into the mysterious, quivering mist. The wave of smudgy vapor rolled on, and a moment later the mist also suddenly evaporated in tenous, swirling wisps that were carried along by the breeze in the wake of the rolling smoke.

Only the infantry detail was there. Of Venusians there was no sign except the single figure stretched prone on the ground beside a little portable machine of complicated appearance.

I learned later that this was the machine that controlled the mist by creating what for want of a better name we called a "magnetic" field, although the force involved was not magnetism despite certain manifestations similar to magnetic phenomena. This particular mist-cloud was a decoy, a camouflage. The enemy had set his control machine on the ground and was about to sneak for safety, but the shrapnel blast hit the misty dome a bit too soon for him.

The accelerated advance of our second line of infantry ended the engagement. They plunged ahead in open order, with supports concentrating on those spots where the line swept through the mist-clouds. Curtains obviously cloaking enemy artillery, were suddenly rent, but not dissipated by pale flashes from within. Others hiding details of enemy infantry, awaited the onsweeping line quietly, or moved slowly toward it. It was around, in and through these that the heaviest fighting, hand-to-hand work, swirled and eddied.

But the line swept on, engulfed the broken fragments of the first line, and in the end slowly surged into the dense forest beyond the area that had been torn up by the barrage, while the third line, which had now come up, sent details of moppers-up scouring through the area of the engagement.

Reserves had been rushed forward quickly in the hope that we might penetrate the tunnels from which the invaders had emerged. But in each case it was found that these tunnels had been blasted behind them by the retiring enemy, and had caved in.

Innumerable engagements of this nature were fought through this period of the war. The fighting was heavy, but the progress of the campaign slow, for the enemy occupied a vast area, about as large, as a matter of fact, as France. In actual number of men per square mile the lines were not nearly as tightly drawn as they were in the old World War, but when the increased efficiency, range and coordi-

nation of the machinery of warfare was taken into account, they were in effect more tightly drawn than they were in that old, crude struggle, and there was far more finesse in strategy and tactics displayed by both sides.

The Mobilization of Science

SO cleverly were the strategic phases of the campaign planned and carried out that it was a long time before we ourselves sensed that the idea of our high command was to drive two wedges into opposite sides of the area occupied by the unearthly enemy until they finally met and separated them into two areas, with the hope that in the process these wedges would pierce or bring us within close striking distance of one or more of the enemy's main bases. Whether he had few or many we did not know. No system of espionage could penetrate very far into the lines of an enemy who had nothing in common with us of Earth except superficial physical resemblance. No man of Venus could be tempted to betray his species by any offers Earth men could make. Few prisoners could be made to talk, and those who did had little of value to tell of the plans or dispositions of their own forces. Most of them committed suicide almost immediately on being taken.

During this period all the scientific resources of Earth were mobilized in grim determination to find methods of checkmating the peculiar sciences and strategies of the invaders from space.

Vast areas back of our lines had to be carefully guarded, for the enemy boring machines could burrow deep under the surface of the ground with relative rapidity, and the rear of no fighting division was ever safe. Time and again the enemy surged up out of the ground far in our rear, in locally overwhelming numbers, taking terrific toll before entire divisions could be pivoted and reserves brought up to enclose them and choke them back into their tunnels.

We knew they had to have air—ventilating systems in their tunnels and underground communities. The weather bureaus of the whole world furnished their experts to study air currents over the enemy area. Spectroscopic, ultra-red and ultra-violet telescopes were developed in the hope that long range chemical analyses of the air might betray the proximity of ventilating outlets or intakes.

Electromagnetic instruments of the utmost sensitivity were invented in the hope of detecting the presence of machinery underground.

Penetrative rocket-bombs were developed—great projectiles to be dropped from aircraft, which after falling a safe distance would automatically develop their rocket power and plunge earthward with acceleration and momentum many times that of gravity, to penetrate far into the ground before they exploded.

To see one of these shells hit the ground was a sight indeed. It would throw up an "earthspout" from 100 to 200 feet high. Then after a terrible pause, would come an awe-inspiring muffled, rumbling roar, and the surface of the ground for a quarter to a half mile in every direction would heave and surge and settle down again with trees frequently still standing, but crazily tilted and askew.

The concussion underground must have been deadly to any living beings in tunnels within a great distance of the explosion. High enough in the air we did not mind. But when we dived too close to the surface the effect was deadening to the senses. At first many of our aviators met death through loss of control over themselves and their machines, due to the concussion.

But of all the locating devices we used the microphonic types proved the most practical of all. Of these there were two kinds, audio and radio. It was the former that had by far the more general value.

It was simple in principle. A thin shaft would be sunk in the ground to a depth of 50 feet or more, and into this would be lowered a multiple microphone device, each microphone element being carefully sound-insulated from its fellows and directionally pointed, and each having its amplifying units. Operators listened at audio receivers for sounds identified as mechanical. And "readers" developed marvelous facility in interpreting the composite and individual graphs that the "light needles" made on sensitized paper as permanent records.

The radio finders were not, of course, really "microphones," but rather highly sensitive and carefully shielded radio receivers of a specialized type, which were "grounded" to the air above (thus reversing the usual procedure). They picked up the ground waves of static given off by enemy machinery of an electrical nature.

Little by little our scientists learned to detect with fair accuracy the presence of the enemy underfoot within a distance of a mile or more, according to the nature of the surface and the subsoil, and for the most part this proved sufficient to prevent their mining under our positions without detection.

The success of these finders in turn was probably responsible for their last desperate move in turning loose the volcanic forces which had proved their undoing on their own planet, and were fated to bring about their downfall again on ours.

Finding they could no longer burrow under our cordon without discovery and subsequent annihilation from our ground penetrating rockets, they took the chance of tampering with the internal heat of a strange planet.

The first we knew of the cataclysmic forces to be let loose was when the upper Amazon river suddenly dwindled and dried. It had been diverted from its course, quite obviously, somewhere within the enemy territory.

It was only a matter of hours before our air scouts found the place where a great chasm had been opened across the river bed, into which the waters were roaring and tumbling. But that was all the good it did us.

Dropping penetrative bombs to kill any of the enemy who might be hidden under ground in the neighborhood did not interrupt the waterfall that tumbled into the depths of the earth. Nor were all the explosives we could pour into the chasm sufficient to cave it in or close it up. Vast masses of earth were blasted loose,

within and around the great hole, but the water washed it down before it had a chance to clog them up.

CHAPTER VII

Cataclysm

I THINK our scientists had a pretty good idea of what was to come, for the high command suddenly got very busy. There was a hasty shifting of divisions and even army corps, without any reason then apparent. Certain geological areas were hastily evacuated.

In some of them the troop movements were incompleted when the cataclysm occurred. Hundreds of square miles of the earth suddenly heaved and boiled at the outcroppings of certain strata; and there began to flow down the valleys and ravines and along the river beds viscous streams of flaming, smoking, all-consuming lava. A number of regiments and one whole division were cut off, marooned by the flaming flood that finally consumed them.

Our line generally was thrown into confusion by its drastic readjustments, and the effect on morale was far from good. The troops were keyed up to fight it out desperately with the interplanetary invaders. But how could they fight such vast forces of nature?

In this moment of confusion the invaders who, either by intention or accident, had released forces that threatened to be more destructive to themselves than to us, suddenly launched their great attack, or migratory onslaught, westward toward the slopes of the Andes, which were well back of our advanced lines on that side. They had to break through or perish by the forces they had themselves conjured up.

The deploying of our defense was far from smooth, in view of the prevailing chaos, and so sudden was the attack that there was no time to shift many divisions from the East to the West front.

Up into the jungle, out of their countless underground burrows, came the enemy hordes in their helmeted suits, their great machines, clanging, grinding, plowing, blasting and slicing paths through the heavy vegetation for them. They abandoned the niceties of military tactics and came on *en masse*.

The pale flashes of their suction guns faintly illuminated the jungles endlessly in all directions, and a gargantuan inferno of shrieking and exploding shells tore air, forest and ground to pieces in front of them as they plowed onward.

Our first line went down before them as a child's tiny sand fort is engulfed by the tide. It had no time to retire.

Our second line evacuated its positions to a depth of several miles, while our air forces and ground artillerly cut into the game with a terrific counter barrage.

So heavy was the air fire that I and my companion scouts were ordered into the mother ship for fear we might be annihilated by the rain of shells from above.

Far, far to the East, I could see the pall of lava smoke. Below in every direction the surface of the earth actually was obliterated by a noxious haze, shot through by the pale and flaming flashes of the Venus and the Earth artillery.

Together with the other plane pilots I stood in the observation room of the great dirigible. But our rôles of spectators were to be interrupted. Col. Benner came in hurriedly.

"To your planes!" he snapped. "Here's where we do a dive-out and get into it—Umbrella ships reported below—General plane mobilization ordered fifteen miles East, 25,000-foot level—We're going to ride the tail of the whole enemy army and strafe h - - l out of 'em—They're in the open now, where their barrage has sliced down the jungle. Let's go!"

One after another we nosedived out of the keel of the big ship and streaked Eastward in a loose string, climbing as we went.

More than 21,000 planes, or six full divisions mobilized at the rendezvous. As far as I could see, aloft and below, the air was filled with the droning "bugs," circling by flights, thirty planes to a flight; regiment above regiment—ten flights to a regiment; brigade over brigade, four regiments each; and division beside division of three brigades each.

For twenty minutes we circled, perfecting formations and waiting for the late comers from the Eastern front. Then from a mere fly speck in the distance, a position that must have been roughly over the rear of the enemy, flashed the general orders on which every one of the 21,600 pilots tuned in.

Regiment by regiment nosed down, dived for speed, and streaked down and away in continuously flattening formations, until viewed in perspective from where I circled they seemed like a vast sheet of immense length and width, but no thickness, skimming away from me through the hazy air.

Then came our turn. Down we went, the roar and hum of motors and wings swelling into a shrieking, whining crescendo. For a while it was all I could do to hold formation, but as my senses automatically reacted from the effects of the heavy acceleration, and my nerves tensed to a sharper co-ordination. I began to scan the haze below and ahead.

Far to the right, and below, came the flash of a suction bomb. It must have been 1,000 feet below our level, but from the corner of my eye I saw an entire flight sucked down into the vacuum, the planes struggling crazily for control.

There were blinding flashes from below and ahead now too, and other "bugs," individually and in groups, were sucked down out of formation.

Destruction of the "Umbrella" Ships

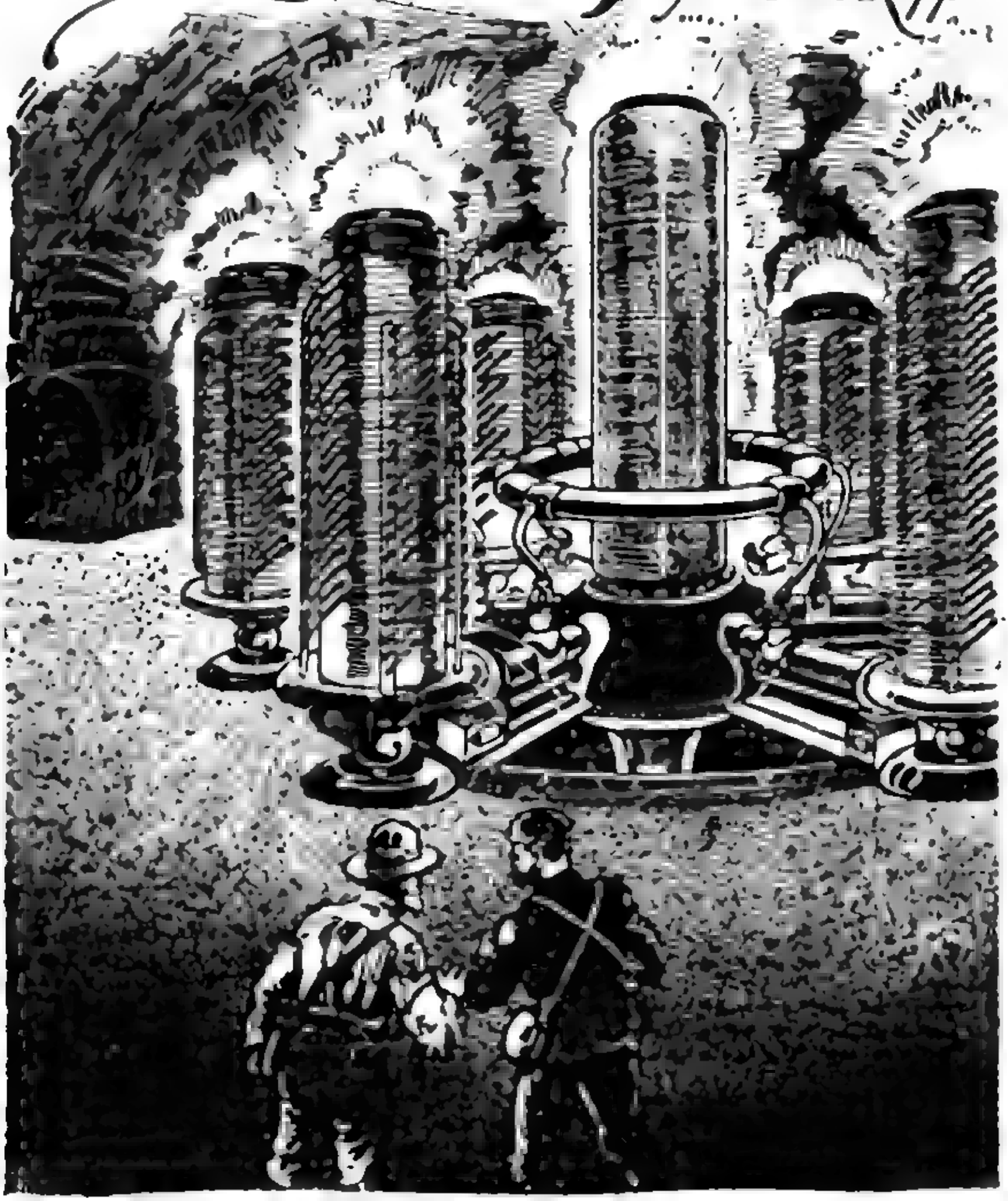
ALL this time we were slanting down at an angle, with ever accelerating speed. The contours of the ground took on definite form; then the rolling masses of jungle and the churned surface of the earth far ahead. Finally the masses of grey-uniformed, helmeted invaders became distinguishable, struggling, writhing forward in massed groups and columns.

Somewhere ahead, our first line contacted with the "umbrella" ships. Regiment-zooming, it rose, while

(*Continued on page* 368)

The Radium Pool

By Ed. Earl Repp



The bases of the cylinders went through the floor of the cavern. Their spinning movement created a terrific suction for the air in the cavern was swirling. Attached to the cylinders were hundreds of small tubes that gave off a deep green ray.

THE RADIUM POOL

What Has Gone Before

JAMES DOWELL, reporter for the Los Angeles Outstander, is sent to accompany Professor Bloch who is going into Death Valley to study strange human remains found there. In the desert they rescue an old man who tells them a strange story. With his partner Driftin' Sands, he had gone into the Manalava Plain, one of the hottest parts of the Valley, to search for Allie Lane, the sweetheart of Sands, who has been missing for forty years. On the way Sands insists that he sees in the desert ahead of them Allie and her father with their wagon. They follow the mirage and finally reach a crater in the hollow of which is a pool of radium salts. Around the crater is a circular cavern from the ceiling of which is suspended the skeletons of two men. Sands in falling down near the pool immerses his fingers in it and on withdrawing finds only the stump remains. But his years seem to be rubbed away and he becomes a young man again. Meanwhile they witness a strange sight. Out of the cave comes a great sphere which revolves over the pool and finally disappears in it. They go into the cave hoping to find Allie Lane there and the wall of the opening is mysteriously blocked up. They find themselves lost and are suddenly surrounded by strange seven-foot beings with faces like frogs. They have tentacles above their heads and by these establish telepathic communication with the two visitors. A shot is fired at one of the beings but from his forehead a greenish fluid runs out and the wound closes up, without damage to him. They close in on the two men and pick them up.

"BOTH Sands and I were carried on the broad chests of the mysterious creatures far into the cavern. They made several abrupt descents and the oppressive air told me that we were far below the surface of the Manalava Plain! Their movements were rapid and forceful and their long skinny legs bore their weight remarkably well, although they wabbled like strutting geese. During the entire course, the tunnel was brilliant with changing colors of various hues from green to red and vermilion—everchanging.

Ed Earl Repp

"As I lay cradled in the tentacle-like arms of the big brute who carried me, I smelled his evil breath. The odor was the same nauseating smell that had curled our nostrils and threatened to explode our lungs on several occasions since we entered the cavern. With each slow blink of his eyelids, there was an accompanying metallic click. Occasionally he opened his toad-like mouth and when he closed it hard, bony lips snapped like the spring of a trap. Sands was being borne along by a broad-backed creature in front of me. I could see his head bobbing with each wobbly step of the beast and I knew that he was unconscious.

"I felt worried about Sands. The grip of the big fellow's arm around his throat could have broken the spine of an ox without any effort. I cursed the brutes venomously. The fellow bearing me tightened his grip around my chest and I was forced to gasp for breath. When I became quiet he loosened his hold. I felt a searing welt rise across my body.

"Presently we were carried into a great, circular chamber far below the surface of the Manalava Plain! The chamber was luminous with the strange, pale green color. In the center spun a huge glowing sphere and it was surrounded by smaller spheres, each spinning in an atmosphere of its own — like the earth—with its suns and moons revolving around it. The huge ball in the center seemed to float in air without any visible support. The smaller spheres likewise spun in mid-air at perhaps a forty-five degree angle from the large one. They emitted a high-pitched whine as they spun.

"My eyes, now accustomed to the luminous glow, searched every corner of the chamber. To the right, standing on a flat rock platform, were three massive chairs of green metal that was studded with precious stones. The chairs were vacant.

"Lined around the circular chamber were several hundred more of the grotesque creatures who had carried Sands and I far into the underground world. They stood motionless as though at attention. From deep in the bowels of the earth came a clanging of bells and each creature in the chamber, with the exception of the two who bore Sands and I across their chests, hung their heads. I heard the scraping of rock against rock over to my right and I allowed my gaze to wander there.

"A huge circular slab of rock was rolling away from an entrance into the chamber. I watched it intently until its removal exposed a glittering doorway. I had become so engrossed in watching the door that I failed to notice that I was being carried toward the platform. As I was borne nearer to the three chairs, I observed standing in the opening the majestic figure of a huge, bestial creature, bedecked in purple and gold robes of a metal that glistened blindingly. The fellow carrying me halted before the platform and placed me on the floor. The tall figure in the doorway moved quickly out of the entrance and walked stiff-legged toward the chairs.

"From his dignity I at once accepted him as the king or chief of the grotesque frog-men. I stood erect, my gaze following him. He appeared not to take the slightest interest in me. I looked around as he neared what I accepted as his throne. Sands was lying still on the broad chest of the brute who had carried him in. His head hung loosely on his shoulders. Disconso-

PERHAPS it is a bit unethical for the editor to wax enthusiastic about any story, but we certainly could not help mentally applauding when we first read "The Radium Pool."

Not since "The Moon Pool" has there been such a story and the second part which we are presenting to you now, is certainly by far the better part of the story.

The adventure interest accumulates gradually and with never-ending vigor the story leaps from adventure to science, so when finally one lays the story aside, it seems as if an entirely new world had been opened to you—a world that is as strange as it will be unforgettable. And if you read the story ten times, you will not fail to be thrilled at the tenth reading as you were at the first.

lately, my gaze again returned to the majestic figure on the throne. He sat stiffly, the tubes above his eyes, waving slowly. While my interest was centered on Sands' lifeless body, two other beings had followed the High Chief onto the throne and sat in the chairs on either side of him.

"To my uttermost surprise I beheld two human beings sitting beside the High Chief, one on either side! And one was a young woman, gayly adorned in brilliant robes of purple and gold! Her wealth of golden brown hair shimmered in the pale green light of the chamber. Her eyes were motionless and she looked out over the room like one in a trance. Her finely cut features and appealing blue eyes caused my pulse to beat more rapidly than ever before in all my life. My whole body tingled with exaltation. I had an impression that her features bore a distinct resemblance to some beautiful face that I had seen before. She stared straight ahead with unblinking eyes. I was unable to remove my eyes from her. Where had I seen that fascinating, clear-cut face? Whose features were they? Ah——I had it!

"Instantly I decided to look again at the photograph Sands had found in the old album back at the spring! Perhaps it was the photograph that had given me the impression of having at some past time beheld the gentle features of the girl.

"I walked unmolested, over to Sands' limp form and reached inside his vest. He was beginning to show signs of life when I brought forth the well-preserved photograph that he said was the picture of Allie Lane for whom we had been searching.

"Every owlish eye in that great assembly of unearthly beings, was riveted on me as I strode, photograph in hand, toward the platform. The dignified leader sat motionless on the throne and regarded me through saucer-like orbs. I felt, even though no sounds issued from his mouth, that he was conversing steadily with our capturers. The tubes, just above his broad forehead, waved in all directions as though catching thought waves being broadcast by the others in the chamber.

"The girl sat in stony immobility. The man on the other side of the High Chief was likewise motionless, his eyes staring straight ahead. The man was slightly wrinkled around the mouth though he looked to be no older than thirty. His jet black hair which had been freshly combed, glistened as from oil. Was this man Alfred Forsythe Lane, father of the beautiful girl whose trail led us to the edge of the radium pool? Hardly, I thought.

"At the edge of the platform I halted, photograph held up before my eyes. For a moment I was utterly stunned! The photograph showed the same delicately rounded chin, finely shaped lips and radiant blue eyes that marked the beauty of the girl in the chair! I stumbled backward a few steps in my astonishment.

"'Allie Lane!' I must have shouted at the top of my lungs, for I heard a patter of feet that brought Driftin' Sands to my side. I looked at him. His face was white even under the luminous green glow that affected him.

"'My God!' he breathed in amazement. 'It's Allie!'

"With a leap Sands jumped to her side on the platform.

An Inquisition

"INSTANTLY the High Chief raised an arm menacingly and a thin shaft of green light shot from the sucker-like tip at the end. Sands placed a wearied hand over his eyes, a small round spot, the color of chalk, appeared on his brow as he sank to the floor heavily. Allie Lane moved her finely shaped head with its brown hair hanging in thin wisps curled around her temples, and stared blankly at her fallen lover. She quivered slightly and raised her dainty white hands to her temples as though striving to bring a return of memory. Presently she gave it up with a shudder and continued to stare straight in front of her. The gaze rested upon me, I felt, and I shifted my own uneasily, helplessly. The grotesque people of the underground had displayed their protective powers on several occasions and I was aware of what my fate would be if I interfered to aid my friend. Whether Sands was dead or merely stunned I could not guess, but I accepted the former readily enough.

"Expecting momentarily to feel the tingle of radium rays carrying me into oblivion, I hung my head. I stood limply at the edge of the platform, full of sorrow over the turn of affairs. Here was Sands, at the end of a forty-year search for his lost sweetheart—the only living thing that had kept him alive—and there was Allie Lane, probably broken in mind and spirit and unable to go to him. Now, I thought, his life was snuffed out while he stood on the very verge of complete happiness. I offered a prayer to our Maker to re-unite them again and let them enjoy the happiness that was theirs by right of nature and heritage!

"I didn't think how strange it was at the time for Allie Lane to be sitting there as fresh in the glory of youth as she was when the photograph had been made of her back in Kansas City forty years ago! I only knew that we had found her. I looked at Sands. He was lying in a heap where he had fallen. No move had been made on the part of the giant tunnel-dwellers to aid him. Certainly I could not! One move and I would meet with the same fate. I was not ready to die. I strained hard to think of some way to help him—to learn if he was dead. My mind was a blank and seemed not to function. Some irresistible influence was smothering all thought. It was then I realized that I was being questioned by the High Chief on the throne. I cast a quick glance past Allie Lane at him. His antennae tubes were pointed straight toward me. I felt the strange power that

seemed to pass from his tubes to my mind. I shuddered for it gave me a terrific pain at the base of my skull. Nevertheless I steeled myself for the ordeal of questioning that I knew would follow. A peculiar feeling came over me. I felt that I was gradually rising out of my physical body. It was an incredible sensation. Then my brain grasped a vibratory mental question. I seemed in a trance.

"'You, Man of the Earth, what brings you into forbidden country?'

"The peculiar eerie question gave me a faint feeling that some time in the dim past I had heard it asked of me through a similar process. I glanced down at my feet. They were invisible. I seemed to hang, eyes only, suspended in a murky haze. Before me, on the throne, sat the three silent figures glowing brightly and tinged with a greenish hue. Sands' inert body seemed to have vanished! I strove to answer my questioner. My lips moved but I could hear no words. My brain told me that an answer was taking definite shape, but it would not be the answer the monster sought!

"'Forbidden country here in America?' I answered him silently. 'Why you must be crazy!'

"At that his saucer-like eyes blinked rapidly. His frog-like beak opened and a red, fiery tongue flicked out of a luminous opening that was his throat. The chamber was in stony silence. Only the click of the High Chief's huge eyelids broke the stillness.

"'You, Man of the Earth,' the words telegraphed to my brain. 'Dare you jest with me? Do you know that I, Abaris, second in command of Jupiter and the entire Universe, have the power and the right to forbid anything or condemn any world!'

"His words struck me as inexplicably funny. How silly and absurd, I thought, was this sudden boast of power from such a hideous, grotesque freak. Had he ever heard of the great armies of the United States that could fly over the Manalava Plain and annihilate his entire band of frog-like freaks? Hardly, I thought. I felt my lips curl up in scorn at his vanity.

"'By what right have you to condemn and destroy?' I asked, more controlled.

"His flat beak opened in a froggish attempt to laugh. A peculiar cackling sound, issued from his cavernous throat. He seemed to be enjoying himself hugely.

"'For a lowly creature like yourself, Man of the Earth, who is doomed, you speak strong words! What right have I to annihilate you? Why, ignorant one, I have the right by all the power of the Universe! I have the power of civilization ten million years in advance of your aboriginal powers! We, your superiors by milleniums, could condemn your earth to complete and instantaneous destruction should we so desire!"

"This lengthy message, telegraphed to my stunned brain, caused me to wonder what sort of beings these creatures were, from where they had come and what was their mission here. Certainly, the owl-eyed freak talked like a military lord. I began to feel that I was the proverbial mouse and the cat was merely playing with me for his own amusement. The strange power the High Chief had displayed in striking Sands to the floor, awed me considerably. Of a certainty, we men on earth boasted of no such strange weapons that shot pencil-thin light rays and killed instantly and silently. Perhaps this giant freak was not boasting after all.

"In spite of my sudden fears that perhaps this tribe of strange creatures might be able to bring into play powers far superior to our own, I still felt contempt and scorn for them. To have my partner—my friend in years of toil and sorrow, suddenly struck down by the beasts when he had found joy, was enough to bring out my hatred. The fact that they held captive, two human beings like myself, one a woman, under a strange influence, only piled fuel onto the fires of my fury.

"'What have you done with my friend, O Abaris, Great and Exalted Ruler of the boundless Universe?' I sneered contemptuously. "'Such a Great and Glorious Ruler as you must take great pleasure in striking down an unarmed man!'

"'I smite the hand that harms, Man of the Earth!' his soundless words shot back, hostilely.

"'His was not the hand that harms, O Brave Abaris! His was the hand of love and loyalty—with a mind of sorrow and grief!'

Abaris Explains

"AT this juncture I shot a glance at Allie Lane. Her profile was beautiful as she turned toward the grotesque creature sitting majestically at her side. Her eyes looked up into the owlish orbs appealingly. My heart jumped suddenly and I felt a lump rising in my throat. The High Chief Abaris looked down at her though wide lids. One of his snaky, tube-like arms writhed upward and encircled her soft shoulders. His head tubes hung drooped in apparent affection for this beautiful girl for whom Sands had spent the best part of his life in constant search. I cursed the huge beast roundly.

"I understood it now. The frightful brute had saved Allie Lane from a horrible death, and through some process unknown to man, he had retained within her the youth and beauty that was hers when he found her at the edge of the radium pool! He must have jealously guarded that youth through the passing of the years that had made Sands, her loyal suitor, an old and broken man! What was the secret of the strange process? Was it the radio-active qualities of the radium that had retained her youth as well as restore the youth of Driftin' Sands? If so, then why hadn't I gone through the same change? Then I remembered that Sands had accidentally dipped his fingers into the radium pool, burning off the tips. The radium must then have sent life-giving qualities surging

through his veins and restored the worn and frayed nerves and tissue of his body! The same injection, but through a different process, I thought, must have been applied to the youthful body of Allie Lane. Her father, too, must necessarily have gone through the same procedure, else how could he have been restored to youth? Why had he been permitted to live at all? Surely, now, his years had passed the century mark!

"But, I thought, Allie Lane would have been better off had she died at the pool! With such a beast as the frog-featured Abaris constantly in her vision and showering her with his affections, a terrible life at best must have been hers! And Abaris must have read Sands' thoughts, too, before he struck the man down. He seemed to take great pride in his possession of the beautiful feminine creature, I felt, and guarded her zealously from others.

"Suddenly my subconscious mind reeled under the pressure of Abaris' strange power of mental telepathy. He rolled his great bald head aside and with owlish eyes, languidly regarded me. My gaze became fastened on his steadily blinking lids. Their metallic clap-clap-clap-clap as they opened and closed, sounded dismally throughout the chamber which was now lighted only with a pale green glow. The three figures on the throne, a deeper green but tinged with a brilliant red aurora, sat quietly. I wondered what had become of Driftin' Sands.

"Abaris' grotesque features stood out abruptly and seemed almost as fair as Allie Lane and her father, under the mixture of colors that glowed from the green and red hues. His great eyes bored into mine so deeply that I felt a sudden panic seize me.

"'You, ignorant Man of the Earth, have seen the power of Jupiter, greatest and most powerful planet in the Universe!' Abaris' words, booming and unspoken, reached my mind. I thought it strange that these grotesque beings could converse in my own language and by mental process at that.

"'Yes,' I admitted reluctantly. 'I have seen them! But do you know that one of our American bombing planes could fly over here and blow you and your crowd to hell?'

"Abaris' frog-like features parted in a grin. His throat rattled mirthfully. I stared at him, awed.

"'Hoh, hoh, hoooah!' My mind throbbed under the force of his booming mental laugh. 'Why, lowly worm!' he shot, his tubes pointing straight at me, 'If I but minded to I could destroy your entire world with one little globule of radium!'

"'What do you mean?' I asked with a sudden desire to learn all I could concerning these strangers and their awe-insipiring powers.

"'Just this!' Abaris said, evenly and with sarcasm, 'We of Jupiter are so far your superiors that you are but worms in comparison. When your people were still clinging by their tails we of Jupiter had already mastered mathematics. During the years that followed and developed you to your present state, we of Jupiter mastered many sciences—one of which brings us to your world now. That is radium. We have mastered radium in all its forms and we are therefore masters of the Universe and all life in it.'

"'Well,' I said, 'why didn't you destroy us here on earth then if you are so powerful? How did you get here on this earth if your planet is Jupiter?'

"'We, Man of the Earth,' he said, amused, as though enjoying the mental conversation immensely and taking great pride in the vast knowledge of his people, 'we do not take life without cause, even though that life is no more to us than your reptiles are to you!'

"'Then why did you kill my friend?' I queried, earnestly. 'Why have you held these two white people with you?'

"'Your friend is unhurt physically, but mentally he now belongs to Jupiter! His intentions were doubtful when he leaped up here beside Eloli, whom your feeble mind refers to as Allie Lane! I should have killed him instantly!'

"I felt unable to think of anything for a moment, and I stared fascinated at the features that confronted me. I noticed that the colors in the chamber were changing again and that the lackadaisical visage of Abaris was growing more pronounced under the varying hues. His saucer-like eye-lids continued their resounding clap-clap-clap like the sound of shutters closing on a camera.

"'I don't believe you, Abaris!' my voice suddenly raised. 'You killed him because you knew that he was Allie Lane's man by all the laws of humanity on this world!'

"'What care we Jovians for the laws of your humanity!' Abaris' thought wave struck me sharply. 'I could have killed you both instantly! You were trespassing on forbidden ground and I therefore had the right to remove you from it!'

"'How did you know we were here?' I asked.

"'Our sentinels on the surface informed us of your coming long before you reached here. We had no intention of harming you unless you entered the crater!'

"'Then that's why you hung up these skeletons out there—to scare us away, eh?' I inquired. 'Did you think a few grinning skulls would make us run?'

"'The skeleton of anything on this earth tends to frighten away the living!' Abaris declared, nonchalantly. 'Even a dog will run from the bones of its kind, why not you who are just a step higher intellectually than the dog?'

"'You're a bragging cuss, aren't you, Abaris?' I shot back with contempt and sarcasm. 'You've been misinformed as to the status of the human race on this world! I could think up a better way to frighten a man than that!'

"'We of Jupiter have many ways to frighten a man if you like to call yourself such. But you see

we are not particularly interested in whether we frighten or not. You and your friend and these two humans beside me are the first to have come here since we arrived from Jupiter. We felt no need of methods to frighten others away!'

They Disappear

"'MY Lord! I thought, had these creatures come to this world from another planet at a time when we on this world were crossing the country in ox-drawn wagon trains? Had they arrived here before Allie Lane and her father wandered into the Manalava Plain?

"'Yes, Man of the Earth,' 'Abaris' mental wave reached me in answer to my thoughts. 'We dropped down from Jupiter, long before your people began crossing your continent. We have been here exactly one hundred of your years and we are now ready to return to Jupiter, if that interests you. Our work here is completed. We return soon to our own world; four hundred million miles away.'

"Four hundred million miles! My mind whirled with staggering figures and I gave it up.

"'I can understand your mathematical deductions, Abaris,' I said, 'but just the same I'm from Missouri and you have to prove to me that you covered all that space just to visit this world. It is hard to believe that any living thing can exist long enough to do it. It don't sound possible!'

"'That's one of the failings of you Men of the Earth,' Abaris said, evenly. 'You think that everything that does not come within your scope of understanding is impossible. We of Jupiter long ago achieved immortality. But why should I, Abaris, second in command of the great Jupiter, explain to a lowly creature such as you, the vastly important facts of interplanetary travel?'

"'You could tell me so I might inform my fellows on this earth that it was actually performed. Otherwise I'll have to call you a liar!' I said, with a false show of bravado. So far no harm had come to me, and Abaris had informed me that Sands suffered no permanent physical injury. I could afford to hold up my chin and meet on equal terms, with the grotesque frog-men of Jupiter! What were they anyhow but unreal, mechanical freaks?

"'Well, to tell the truth, your world will never learn the secret from a Jovian, Man of the Earth!' Abaris' thought vibrations seemed to say. 'I might say that some day your scientists may evolve a medium for interplanetary travel and we of Jupiter do not intend to shorten the period of time when you will eventually try to visit us. You will not be welcome!'

"'You're giving us a lot more credit than you have been saying was due us, Abaris,' I remarked with a grin. 'I'm glad you have come around to to that. It makes me feel better to know that I'm a little more intelligent than a crawling worm.'

"Suddenly the chamber brightened under the brilliance of powerful rays. Small spheres, spinning rapidly and glowing luminously, shot restlessly to and fro in the far end of the chamber. At the sound they made I instinctively turne to them for several seconds. When my eyes again returned to Abaris and his two human companions, they were gone! They had vanished apparently in thin air during the few short seconds my eyes had wandered around the brilliantly lighted chamber.

"Save for an inert heap lying on the throne in the same position that I had seen Sands when he had fallen, the chamber was completely deserted. The spheres continued their back and forth movement as I dashed quickly to Sands' side. At the close range I discovered that his body was tinged with the same luminous glow that I had seen outlining the bodies of Abaris, Allie Lane and her father. Sands seemed stunned. He was breathing but his lungs functioned laboriously.

"'Sands!' I cried, shaking him by the shoulder. 'Are you hurt?'

"From his lips issued a deep groan. I swung his inert body around for a look at his face. The color of it was a deeper green than it had been before. I stretched him out flat on his back and rubbed his numbed hands to restore his circulation, but it availed me nothing. Then I remembered that on my desert prospects I always carried a square lump of camphor in my pockets to rub on my lips when they became parched from the heat. I searched through my pockets for it and was overjoyed when I found it. It was soft and spongy.

"Quickly I massaged Sands' lips and nostrils. Whether camphor would serve in the place of the more powerful spirits of ammonia, I did not know, but you can imagine my joy when his lids suddenly fluttered and his lips parted. The camphor fumes had actually brought him out of the faint into which the powerful rays from Abaris' deadly weapon had thrown him.

"I laughed nervously. 'That's it, old timer!' I said, 'Snap out of it! The devil said he didn't hurt you! We've got to get Allie and her father out of here. These freaks are planning to get away from here in a hurry, taking Allie and her dad with them. Sit still and take it easy for a minute!'

"Sands sat very still for several minutes, his head resting in his hands. I squatted on the floor of the platform beside him, my eyes scouring every side of the circular chamber. To the right, the entrance into the chamber through which had come Allie Lane, her father and Abaris, stood open. The huge circular rock which must have weighed many tons had not been replaced over the opening.

"The most conspicuous thing in the entire chamber was the fair-sized globe in the center, resting on an axis and revolving rapidly. From the distance I could see that it was lined with many criss-cross markings and glowed as though containing a transparent liquid of a beautiful emerald color, much similar to colored glass globes gener-

ally displayed in drug store windows, in the city. Occasionally the brilliant spheres that hung, spinning in mid-air, darted suddenly toward the larger globe in the center. When one of the smaller spheres neared it, the central ball emitted a peculiar high-pitched hum. The globes, combined with the darting lights, gave me the impression that they must be used by the Jovians for some astronomical purpose. The big sphere, I thought, must represent the home planet of the grotesque beings. What else could they be used for, I wondered? But I was due to learn much before I got out of there.

CHAPTER VI

Sands Recovers

"PRESENTLY Sands stood erect. He looked around him for several seconds evidently to get his bearings. I watched him nervously. What had Abaris meant when he said that 'mentally Sands belonged to Jupiter?' I knew when I looked into Sands' eyes. Like fathomless abysses, his eyes glowed like sulphurous fires. The pupils had grown until they seemed to disappear into the rim entirely! He seemed to be in the same trance that had held Allie Lane's and her father's eyes staring straight ahead without apparently comprehensive powers. Held in the embrace of the strange hypnotism that had probably forced Allie and her father to do the slightest bidding of the frog-like creatures, Sands truly belonged to Jupiter! At once I resigned myself to whatever fate might be in store for me for I could not hope for any co-operation from Sands.

"When I spoke to him he merely stared blankly, although I was certain that he understood my words. His lips moved to answer but no words formed in his throat. He seemed to have been stricken dumb! Suddenly I began an attempt to converse with him through the strange mental telepathy of the Jovians, but try as I might I received no response. He was a doomed man unless Abaris would restore him to his normal self.

"I shook him by the arm.

"'I think,' I said to him, pointing to the opening from which Abaris had come into the chamber and into which he had doubtless vanished, 'that we had better find Allie Lane and her father if we hope to get out of here alive. You know that she's here and alive, don't you, Sands?'

"To me it appeared that he made an attempt to speak when he heard Allie's name mentioned, but he merely stared dumbly. At any rate I believed he understood what I had said.

"I nudged him and he trembled under the touch.

"'If we can get to Allie and her father without these critters knowing it,' I whispered into his ear, 'she might be able to point a way out of here. If we can get out I'll strike toward Stovepipe Wells and send a telegram to Los Angeles asking for help. I'm afraid we'll need a couple of bombing planes from San Pedro to get us out of this mess!'

"I grabbed him by the arm and hustled him toward the circular shaft leading from the chamber. He came readily enough but when I loosened the pressure on his arm he stood there, stock still. He seemed to have no will power whatever and his legs moved only because I hustled him along. Perhaps the grip of the strange influence that held him would soon vanish, I thought. But for the present he remained in its embrace, physically and mentally!

"As we entered the only open shaft leading out of the chamber, a high-pitched musical note became audible. I wondered if our movements had sounded some mysterious warning. As we continued on into the luminous tunnel that glittered with deposits of priceless gems, the musical note rose higher and higher so that it seemed to tax the sense of hearing to its uttermost. Questioningly I turned to Sands. One of his trembling hands was chafing his temples with thumb and forefinger. The sound gradually became a wail like the metallic scream we had heard before entering the cave that led down to the chamber.

"Suddenly I became aware that Sands had broken the influence that had held him! With a frenzied scream he leaped aside and away from me. I gazed in wonder at the man as he crouched like a beast at bay. I expected him momentarily to spring at my throat. But he finally recognized me and became controlled when I assured him the Jovians were not in sight. His first questions were of Allie Lane. Had he really seen her, he wanted to know, or had he been suffering from a brain fever? Was she really alive—as beautiful as ever? I assured him that she was.

"'Lord!' he gasped, shuddering. 'That noise would drive a man insane!'

"'Yes,' I whispered softly, 'But you ought to thank it for bringing you to your senses!' I believed the shrill sounds were actually responsible for his recovery.

"'What do you mean?' he asked, blankly.

"'Don't you know that the Big Chief of these freaks bounced you for jumping onto the platform?'

"'I don't remember anything but that I'd seen or dreamed I've seen Allie Lane alive!' he said, disconsolately.

"'Well,' I explained, 'The High Chief, who calls himself by the name of Abaris, didn't like the idea of you getting familiar with Allie and he knocked you out cold. I thought he killed you and he might have at that had he wanted to. I thought you were a goner!'

"'He's got a hell of a nerve then!' he exploded, his face twitching in terrible rage that under the glow of green made him almost as grotesque as Abaris himself. 'I've loved Allie Lane all my life and now that I've found her nothing but death will stop me from having her!'

"'We haven't found her yet, Sands,' I reminded

him softly. 'She's somewhere down this tunnel! I think we ought to get to her as soon as we can. Those devils are going to leave here! Abaris'll probably take Allie with him!'

"'How do they think they can get away so quick?' he inquired.

"'I don't know that yet,' I said. 'But we'll soon find out.'

"For perhaps several hundred feet we picked our way, hugging the gem-studded walls, along the tunnel though which Allie Lane had entered the chamber. Overhead small balls of light flitted occasionally, illuminating the entire passageway. We encountered several smaller passageways branching off from the main shaft but we continued along the wider thoroughfare. What had become of the Jovians? I wondered, as we slowly edged our way along the wall. The only thing that seemed to mark their existence in the great underground maze of tunnel and caverns, deep below Death Valley, was the persistent high-pitched musical notes that smashed into the ear-drums with an unending viciousness.

The Underground Search

"PRESENTLY our footsteps led us into another circular chamber somewhat larger than the one into which Abaris had come. This great room was illuminated by darting lights which exposed units of rapidly revolving machinery from which emanated the high-pitched musical notes! I motioned Sands to halt until we studied the apparatus.

"In our appraisal of the machinery we saw what appeared to be perhaps a half dozen cylindrical tubes that stood upright, spinning rapidly. Over each glowed a pale green luminosity. The bases of the cylinders went through the hard rock floor of the chamber and their spinning movement created a terrific suction, for the air in the cavern was swirling. Attached to each of the cylinders were hundreds of small tubes that gave off a deep green ray for their entire length. One tube ran from the cylinders to a central manifold to which was attached a larger tube that fairly sputtered and glowed under a force similar to but more powerful than a great vacuum tube.

"Audible even above the noise that was created by the rapid whirl of the peculiar machines, came the steady, rhythmic throb of centrifugal pumps. The throb was the same sound that we had heard while we stood for the first time on the rim overlooking the crater containing the radium pool.

"Lights floated above the spinning machinery. They made little bright spots in the luminous green that formed the drafty atmosphere, like lanterns being swung rapidly in a murky fog. I turned to Sands who was standing just behind me staring over my shoulder, intently watching the motion of the machinery and the darting lights.

"'I'm beginning to believe Abaris now,' I whispered in his ear. 'These devils are actually draining this world of an unknown radium deposit! All this machinery, the spheres and lights must be operated by radium power of intensity that is not possessed in the small quantities that we have found so far!'

"'Well that might be so, pardner,' Sands placed his lips close to my ear, 'But I'm interested in Allie Lane, nothing else! Let's find her!'

"I gave him an assuring nudge and we edged our way along the wall of the circular chamber, maintaining a safe distance from the whirling machinery for it seemed possessed with a powerful magnetism. I would like to have studied it closer, but something seemed to warn me to remain a safe distance away from whirling cylinders which spun like electrical generators with the tubes connected like generating brushes. I might be drawn into the whirling things and be sucked to death!

"I was still awed over the sudden disappearance of the Jovians and felt that their absence spelled some sinister disaster to us. I momentarily expected some of them to appear and seize us. With an effort I cast off the feeling and we continued along the chamber wall.

"Suddenly we came to an exit shaft just high enough to admit a Jovian, without bending. I raised an arm to estimate the height of the ceiling. My fingertips just scraped it. The tunnel was in total darkness and this appeared to be the only exit from the chamber with the exception of the one through which we had entered. We clung, hand in hand, as we went into it. We had not gone more than a dozen steps until we were enveloped in an inky blackness. Certainly, I thought, the Jovians must be aware, through their peculiar mental telepathy, that we were exploring their secret chambers. Why didn't they swoop down upon us and challenge our progress? Perhaps, I thought, they did not figure it worthwhile, believing that we would eventually lose ourselves in the network of underground vistas, tunnels and chambers, and die as the result. It was a grim outlook for both of us at best, but I had one thing—the assurance of Abaris himself, that the Jovians had no intention of harming us seriously. On the other hand, neither would they go out of their way to aid us. That was certain!

"Eventually we became somewhat accustomed to the inky blackness of the tunnel and we were able to make out the forms of each other. Staring straight ahead I discovered what I accepted to be a small circular hole through which came a faint luminosity. We made for it as rapidly as we could, although we were extremely cautious and fearful lest we step into one of the bottomless abysses which I felt existed in the underground world.

"We edged our way along the tunnel for perhaps a quarter of a mile before we eventually came to the circular light which we had seen. I was not surprised when we found that it was an en-

trance or an exit of another chamber! We approached it carefully not knowing what might lie ahead. We had no intention of exposing ourselves to the ire of Abaris could we help it. We wanted to find Allie Lane and her father—now that he too was alive! I crawled on hands and knees to the tunnel outlet. Sands was on the opposite side of the hole. We peered intently into the chamber which was brilliantly lighted. The white brightness of the light gave me an impression that it emanated from the sun! It blinded us temporarily.

"The chamber was decorated gorgeously in purple and gold drapes that hung suspended from the room's walls. Massive metal chairs, like the three on the platform back in the first chamber, stood in artistic positions. On one side of the wall, draped with a yellow cloth of metal that glistened like fire in the brilliant light, hung a great sheet of glass-like material that mirrored other objects in the chamber. Under it stood a golden dressing table at which was a frail silver bench. Truly, I thought, as I surveyed the mirror, vanity and bench, these objects could be of no use to anyone except a beautiful woman! The thought gave birth to another idea. Perhaps this was the room to which Allie Lane had been confined!

"My eyes wandered to the far end of the chamber. To my surprise there stood, near the wall, a massive couch that seemed to have been hewn from a great emerald block. Its coverings were of a soft, silken material, edged with gold! As I stared at the beautiful piece my eyes detected a slight movement of the coverings. I looked on the couch awestruck.

[illegible]

"THERE before our very eyes, and apparently alone, lay Allie Lane on the silken covered, emerald couch! From underneath her brilliant robes protruded a dainty foot and ankle. Her face lay buried in her arms and her body wracked with silent sobs, her brown hair shimmering in the glare of the light. I looked at Sands, across the tunnel outlet.

"He stared intently at the reclining figure, his mouth agape. He allowed a hand to run nervously across his brow as though to gain assurance that his eyes were not playing him false. Then I made a careful scrutiny of the chamber to make certain that Allie was alone.

"'Sands!' I hissed, in low undertones that could not have been heard beyond the few feet that separated us. 'There's your chance! There's Allie Lane on that couch, sobbing for you! Go to her, partner! I'll stay here and watch!'

"Sands looked at me for an instant, then taking my hand he squeezed it until my fingers ached.

"'Thanks, pard!' was all he said, but his eyes showed what words would fail to tell. Releasing his grip on my hand he stepped softly into the chamber, and strode lightly with a buoyant step, toward the silken couch. A lump rose in my throat as I watched him moving swiftly toward the girl he had gone through hell to find. Few men would have remained loyal as he to this slip of a girl and hunted in every nook of California for more than forty long, weary years! It was his great love for her in the first place, his beautiful sense of loyalty, that had caused me to join him in the last few years of his search. Now he was at her side!

"'Allie! Allie!' his voice, softly appealing, came to me where I squatted, silently guarding the chamber. My eyes wandered around the room, nothing escaping them. Again came Sands' appealing call. I looked at him as he stood beside the couch, arms outstretched. The girl lay perfectly still now, and her face remained buried in her arms as though fearful to look up. Slowly her head turned. From where I squatted, I could see her profile as it turned towards Sands, tears like pearls, streaming down her cheek. I expected to see again her sweet features staring mutely blank as they were before me when I first beheld her.

"Suddenly the girl sat upright and turned her face up to Sands! Her eyes widened in amazement and fright. I watched her closely, temporarily forgetting my own sworn duty to stand guard over the chamber. Would she recognize her lover of forty years ago? I wondered if she really would. Or was she still under the spell of some strange Jovian trance? My blood pounded at my temples in those few seconds of uncertainty. I could imagine her amazement at seeing Sands but I could not comprehend her delay in flying to his embrace if she still loved him. She sat very still, staring up into Sands' luminous green features with their month's growth of beard. Perhaps his radium affliction and his beard had puzzled her I thought. That was true. She did not recognize him immediately as the result. For long minutes she stared at him through glistening tears.

"Then with a soft cry Allie Lane literally flew into his arms. Sands squeezed her close to him, his face buried in her tumbled brown hair. A feeling of exultation and of triumph surged through my whole body and I slapped my thigh with joy. I was immensely happy! But my joy was short lived. I always was more or less of a crank and my happiness soon fled before a cloud of gloom that formed sinister thoughts in my brain.

"Now that Sands and Allie Lane were together again, how were they to escape from the underground outpost of Jupiter? If we did succeed in finding our way out of the maze of tunnels, how did we expect to traverse Death Valley without water? It was impossible! Better had we all remain hidden far below Death Valley's burning surface than to expose ourselves to the sinister power of Abaris or the terrible fatal heat of the surface!

"Meanwhile my attention was drawn again to the two lovers as they stood beside the silken couch. Allie nestled close to the broad, powerful chest of

her sweetheart and spoke to him in a low, musical voice. Quickly I glanced around the room trying not to listen to them. I had already a violent feeling of being an intruder on their reunion.

"'Oh, Robert!' her voice, tense with both fright and joy. 'How did you ever find me—why did you risk your life to come here in the midst of these terrible creatures? I'm so afraid!'

"'I love you, Allie!' Sands whispered affectionately. 'I love you better than life itself! I've searched for you for many years and I would have continued searching until I could no longer crawl! At last I have found you, Allie, and I shall never leave you again!'

"'Why, Robert!' she suddenly exclaimed. 'You haven't searched for me for many years! You couldn't have because you are just the same Bob Sands you were when you started to California. Why did you let those terrible whiskers grow? I don't like them.' Allie emitted a little musical laugh; then continued. 'You must shave those horrible whiskers off at once!'

"'Don't you know, Allie dear, that you have been lost from me for over forty years? I've forgotten just exactly how many years. I've been searching so long that I've lost track of time.' Sands whispered softly, looking into her expressive eyes. A smile played at the corners of her lips.

"'You are fooling, Robert,' she said, searching his face for proof of jest. 'It just couldn't be! Why Robert I'd be an old woman now if it were true—I'd be almost sixty.'

"'Good Lord!' I gasped to myself as I stood guard over the chamber and this secret love tryst between Allie Lane and Driftin' Sands. Didn't she know that she's been lost to the world for over forty years? Poor girl! Sands oughtn't to tell her! Then, again, it might be best for her to know everything!

"I listened intently, for now I wanted to learn any information that Allie might give to Sands regarding the grotesque Jovians and their plans. The information might aid us materially in finding ways and means of escaping them.

CHAPTER VII

How to Escape?

"SHE was crying softly, 'It's hard to believe you Robert!' I know that you wouldn't lie to me—but it does seem impossible. Why I'm just the same as I was when you left me back in Kansas City—I don't seem to have grown older! Let me look at myself, please dear?'

"Allie walked with faltering steps over to the huge mirror hanging on the wall, and stared into it, her hands wandering softly over her features. Sands walked to her side and peered into the radium reflector. The reflection he witnessed there caused him to leap aside. For the first time he saw his face since the radio-active qualities of the radium had restored his youth. Here he was, in reality an old man who had been suddenly returned to youth. And instead of seeing the visage of a wrinkled and weatherbeaten old man he beheld the features of Robert Sands as they were when he arrived in California forty years before! His was a surprise beyond description of words. He ran a hand over his face incredulously.

"Taking this opportunity to attract his attention, I whistled softly. He looked up with a jerk and patting Allie lightly on the shoulder, he came to the entrance of the tunnel where I squatted. Allie was staring into the mirror, incredulously, as though unable to believe that under ordinary circumstances she would be in the autumn of life on this earth—that the beautiful face in the mirror would long ago have become wrinkled and shrunken!

"'Hadn't we better get Allie's father and try to get out of here, Sands?' I asked him. 'Those devils might show up any minute!'

"'I plum forgot about you, pardner,' he said, apologetically. 'I forgot about everything. Have you any idea how we're going to get out of here? I haven't! Maybe Allie knows of some way. I'll ask her.'

"'Yes, ask her now,' I advised. 'It's now or never!'

"With that he walked back to Allie. At the scraping sound of his boots she turned to him, smiling joyously.

"'Allie dear,' I heard him whisper, 'I brought a friend of mine here. He's standing guard to warn us if anyone comes. I've got him in this terrible predicament and I want to get him out—get you and all of us out of here. You want to go with me back to civilization, don't you dear?'

"'I will go anywhere with you, Robert,' she said, placing her hands on his chest endearingly.

"'Then, dear, can you tell me how to lead us out?'

"'I know of only one way to get out of here, Robert,' she whispered, 'but Abaris has guards there constantly. I'm afraid we could not get through them. You needn't be afraid of Abaris, Bob dear. He has been very kind to me and daddy.'

"'Humph!' Sands snorted, curtly. 'He has not been so nice to me! I'd like to blast him to hell! He knocked me cold when I first saw you, Allie, out there on the throne!'

"'You saw me there, Robert?' she asked. 'And Abaris harmed you when you came near me?'

"'He did, Allie! Knocked me plumb out and nearly killed me!'

"'The brute!' she said, angrily. 'Well, maybe we'll find a way out of here, Robert! Let me call father. He's in the room next to me. Wait here!'

"Sands returned to the tunnel and squatted in the semi-darkness beside me. He was breathing hard with excitement, and there was a twinkle of joy and anticipation that formed crows' feet at the

sides of his eyes. He seemed suddenly a very joyous man and forgetful of the sinister danger that hovered over all of us. What would happen, I wondered, if Abaris suddenly came upon the secret love tryst of Sands and his sweetheart? Would he fly into a sudden rage and destroy us with his terrible, invisible weapon that shot green, pencil-thin rays and killed instantly? We sat silently, Sands with his thoughts of love and happiness—I with thoughts of danger and death.

"Presently we heard a sound like the scraping of feet. Sands and I shrank close to the tunnel's wall in the semi-darkness. Our fears fled, however, when Allie came into the chamber followed by her father. Lane appeared, at close range, to be a man of about forty. His hair was black and his eyes were gray and penetrating. His carriage was that of a man in his prime of life, full of power and vigor and his eyes flashed as they searched Allie's room nervously. Sands got to his feet and walked slowly into the lighted chamber. Lane stopped abruptly and surveyed him with an incredulous stare. Suddenly he stepped swiftly to Sands' side, their hands met firmly.

"'I'd given up all hope of ever seeing you again, Bob,' he said in a clear voice that tingled with excitement. 'It is indeed, a pleasure to have you with us again. I'm sure Allie is glad.'

"'Thanks, Mr. Lane!' Sands returned. 'It's been a long time, but I've struggled hard for this meeting. You've faired well under conditions—you and Allie, but we've got to get away from these frog-faced freaks here. Tell me what you know about a way out and we'll start at once.'

"'Just like you, Bob,' Lane said, admiringly. 'You always did want to be the first to get started. Let's sit down and talk it over. I'm terribly afraid that we'll find it hard to get out, however.'

"'I've gone through a lot,' Sands whispered. 'A little more wouldn't amount to much.'

"'Maybe not, Bob,' Lane interjected with a frown. 'But this is one time when you do not know what you are up against. As much as I'd like to get back home to my friends, I can't see any definite way to escape. But I'll co-operate to the fullest for yours and Allie's sake.'

"The three of them walked softly to Allie's silken couch and sat down, Allie close to Sands, his arms about her waist. I heard a faint sound issuing from the tunnel that led from Lane's chamber. I held my breath in fear. Was Abaris or some of his Jovians coming upon the scene? My blood pounded as I listened with my hands cupped behind my ears to magnify any sound. No more sounds came and I breathed easier. I turned again to the three in Allie's room. Lane was speaking, his voice, in muffled tones, reached me.

"'Allie explained to me how you came to be here, Bob,' he was saying, 'so we won't recount it again. These strange people here claim they are from the planet Jupiter and came here solely for the purpose of obtaining a great supply of radium. It seems that they have exhausted the supply on their own planet. Through delicate instruments, Abaris says, their scientists discovered that this earth contained a great deposit of the metal. They henceforth set out to get it because life on their planet depends upon it for existence. If Abaris fails, it means that perhaps the entire population of Jupiter will be wiped out unless some other heavenly body is found to contain a deposit.'

"'How the devil did they ever get here?' Sands asked, interestedly.

Lane's Story

"'I'M coming to that now, Bob,' Lane continued, softly. 'It sounds quite impossible but it is a fact that Abaris and his henchmen left Jupiter in a great spherical machine similar to some of the spheres that you probably saw on your way in here. This sphere, which is capable of interstellar travel, propelled by a radium process known only to their mechanics, is ready at this minute to return to Jupiter with the greater stock of that metal. For a long time they have been pumping radium out of the earth and sending it to Jupiter in small spheres which are controlled and guided by an unknown source of power. Abaris says that the deposit here is about exhausted and the cylinder pumps are bringing up the last drops of radium existing in this earth!'

"'Abaris expects to halt the pumps very soon and enter the interplanetary sphere for departure to Jupiter! He has said that we were to accompany him to his planet and being unable to escape Allie and I have resigned ourselves to whatever fate is in store for us. I must admit that Abaris has been very good to us and while we would certainly like to get back to our people, I hold no animosity against him, except, of course, that his appearance, as are all the rest of his kind, is horrifying to us. But we have become adapted to the environment, yet we must naturally rebel against being spirited away from this glorious world of ours—to perhaps be regarded on Jupiter much in the same manner as we have looked upon strange animals here.

"'For sometime I have suspected that Abaris in his grotesque way, is exceptionally fond of Allie! She has wanted for nothing. Her every wish has been granted, but he will not consent to our appearing before the multitude unless we submit to being placed under a strange power. In other words we are forced to undergo hypnotism for a reason that I have not been able to learn. That is why we did not see you when you stood before the platform in the throne chamber.

"'As Allie told you, there is one exit from this underground world and that is guarded constantly either by the Jovians themselves or their grotesque, death-dealing mechanical guards in the shape of a cactus tree with arms like an octopus. The mechanical Jovians seem to have all the powers of

the creatures themselves, lacking only their mental faculties. Unless controlled by a living hand they are helpless.

"'These Jovians are really geniuses in all forms. You have seen the series of spheres in the throne room with the large hall in the center. The large sphere is Jupiter in a miniature orbit. The small spheres are its moons, as *good* Abaris explained to us. Through these they are able to watch the progress of their radium spheres as they shoot their way toward Jupiter. The large spheres show their passage very plainly. But these explanations of Jovian objects and scientific genius are not getting us to our goal. So let us consider the possibility of escape. I have a plan that we may be able to use.'

"I listened intently to the plan of possible action as Lane outlined it to Sands. Allie's father explained that at a certain time the guards at the only avenue of escape would be changed and the mechanical Jovians with their tentacle-like arms, controlled by a remote central, would be put in their places. Lane explained how he had previously located the source of control over the mechanical men and was therefore, perhaps, in the position to disconnect the controlling system and suspend their activity. This sounded like a very excellent plan, but how, I thought, would it be possible for us to steal near the central control apparatus in our attempt to disconnect it? Surely, the Jovians must maintain a constant guard over such delicate and important apparatus. But on the other hand, they may not feel a need of it in view of the fact that Allie Lane and her father had been with them so long that they accepted them as being harmless.

"At any rate, Sands approved of the plan and it was decided that the attempt to escape would be made at a time when Lane was to give a low whistle and we would all meet in Allie's chamber, providing, of course, that the way was clear. Lane, with his forefinger, drew an invisible outline, showing the tunnel through which we were to go. Sands watched him closely and absorbed the information. Meanwhile, I shot rapid glances around the chamber in its entirety in my part as guard. Several times my heart jumped when I heard sounds that softly broke the stillness of the cavern, but the sounds failed to bring what I expected—the grotesque Jovians.

"Sands was standing in the center of the room now, Allie Lane in his arms. They kissed endearingly. Allie's father paced the floor nervously. Suddenly Lane stopped pacing and faced his daughter and her lover. He opened his lips to say something, thought better of it, then turned half away. He swung around presently as though he had decided on some question confronting him, and spoke softly.

"'Allie,' his words, nervous and tense, reached me. 'You love, Bob, don't you dear?'

"'As well as life, father,' she answered. Sands turned to look at Lane, puzzled.

"'Suppose, then,' Lane returned, 'that you marry Bob now. It would be a good thing in the face of whatever confronts us.'

"'I would marry him now, father,' Allie said in a half whisper that I barely caught. 'But how?'

"'You forget, my dear, that I was a minister back in Kansas City,' her father smiled.

"'I've waited a long time, Allie,' Sands put in, holding Allie's shoulder and looking into her eyes lovingly.

"'Then I will marry you at once, Robert,' she said, her eyes shining with happy tears. 'Father can perform the ceremony.'

Caught!

"FASCINATED, I watched the procedure that followed, forgetting my duty as guard in whose hands must rest the lives of the happy three. With my eyes and attention on Allie as she whispered 'I do,' I failed to notice that Abaris had suddenly come to the entrance of the chamber and was standing there silently regarding the trio. Lane was saying 'I now pronounce you man and wife,' when I beheld Abaris' towering form as he stood menacingly just inside the room. The tubes of his forehead stuck out rigidly, his tentacle-like arms twitching in anger, and his owlish eyes opened and closed rapidly. I shrank back into the darkness of the tunnel, fearful, lest I be discovered. From my hiding place, however, I could see the entire chamber.

"As though struck by some terrific force, Sands and Lane at once spun around and faced Abaris. Allie emitted a fearful little cry and shrank back against the wall. Abaris' tubes were pointed at them menacingly and I knew that he was speaking to them in his peculiar mental telepathy. What words flew between them I was not able to catch for I had learned that I could not receive the wave vibrations unless the tubes were pointing directly at me.

"Suddenly I heard Sands' words as he angrily informed Abaris that Allie had just become his wife and that it was no man's business what he was doing in the chamber with her. His features twitched with growing anger as he spoke, his hands were clenched.

"'You, frog-face!' I heard him shout, 'I've searched for Allie Lane for forty years! Now that I have found her and she has become my wife, you nor anyone else can take her away from me alive!'

"'Eloli is the bride of Jupiter, Man of the Earth!' I caught the thunderous vibrations from Abaris' tubes which now waved spasmodically in all directions. His thoughts were so powerful that they carried to me where I crouched.

"'Allie Lane is my wife!' cried Sands, hotly. 'We die before she goes with you to your planet of crazy freaks!'

"'Yes, O Abaris,' Lane put in, weakly, shaking as one palsied. 'Allie is this man's wife. You

cannot take her away from him. It is the law of humanity!'

"Abaris' frog-like beak opened and then closed with a resounding snap. I expected him momentarily to bring into play his terrible, invisible ray of death. His skinny, tube-like legs held up his barrel-shaped body admirably, I thought, as I watched him from my hiding place. They seemed like stilts, unjointed except at the hips, around which was draped a narrow breech cloth of gold-edged purple. His body glistened oilily and around his bald, misshapen head rested a thin metal band, glowing luminously green. His antennae tubes waved angrily.

"'Eloli goes with Abaris to Jupiter!' 'Abaris thundered, his vibrations reaching me sharply. I shuddered under the force of his powerful thought waves. 'On Jupiter we have specimens of many planetarial beings. Our scientists would like to study specimens of the aborigines of this planet. Therefore the three of you will accompany me to Jupiter! Eloli comes as the bride of Jove!'

"'We would die there, O Abaris,' Lane parried, dejectedly. 'We of this earth could not adapt ourselves to your environment!'

"'You do not seem to understand, Man of the Earth,' Abaris' vibrations said, 'that we of Jupiter have accomplished immortality. There is no death on Jupiter! Will you come voluntarily or shall I be forced to resort to other methods?'

"From where I lay hidden in terror, I watched Sands' face. In his anger his features twisted with fury. I could not help him should he attempt to attack the huge Jovian commander who stood before him. If I only could, how gladly I would have gone into the chamber!

"Suddenly I heard a dismal hooting from somewhere behind Abaris, that gradually grew nearer. I watched the opening of the tunnel behind him expecting momentarily to see his followers enter the room. Two abreast they came, their bodies shining with freshly applied oil, their loins covered with shimmering breech-cloths. Unlike Abaris, they wore no bands around their huge heads. Like soldiers, their line broke in the center where Abaris' huge body stood like a pivot, and they single-filed around the walls of the circular chamber.

"I shot a quick glance at Sands. He stood belligerently watching. Allie had crept into his arms and buried her head against his bosom. Lane stared down at the floor, downcast and utterly dejected. When I first beheld Lane, I was impressed with his flashing eyes and strong, powerful body and had figured upon his co-operation at such a dire moment as this. But perhaps, I thought, he realized unlike Sands and myself, the utter futility of objecting to the demands of the Jovians. But Sands was of a different mettle.

"Slowly he moved Allie behind him and again faced Abaris. The Jovians lined around the chamber wall, stood apparently at attention. They made no move to interfere. Had Abaris ordered them to remain inactive, relying upon his own power of combat to force the three humans into submission?

"'Frog-face!' Sands shouted, insultingly, at 'Abaris. 'You call off your dogs and we'll settle this right now! I'm not afraid of your crazy lights and even if I was I'd rather die than submit to you!'

"Abaris' throat cackled with his peculiar laugh. His owlish eyes stared through unblinking lids. Sands approached him with sinister steadiness, crouched ready to spring at the bull-like throat of the giant. I stared at him fearfully. Here was the end, I thought, as Abaris tilted his huge head to look down upon his insignificant antagonist. I glanced around the chamber at the froggish Jovians. They continued to stand silently at attention.

CHAPTER VIII

The Struggle

"AS I watched the unfolding of the terrible scene in the chamber, I found myself wondering what I would do if Sands actually attempted to fight his way through the death-dealing rays of the Jovians. My hand accidentally touched my gun butt and for the first time since I had used the weapon back in the first tunnel, I remembered that I still possessed it. I felt somewhat heartened at the reassuring touch but how useless it was in fighting the grotesque frog-men from the distant world! Surely it could not kill or disable them for hadn't I thumbed a slug into the bony features of one of them? That slug would have killed a man instantly, but the Jovian had no more than croaked as the lead tore through his head!

"I patted the gun affectionately and inspected the cylinder. Reloading I snapped it back into its holster with a grim determination that I would use it! Better had Allie Lane, her father and Driftin' Sands rest in peace on this earth, than in mortal terror forever on Jupiter, I thought!

"Suddenly my eyes were brought back to the chamber by a curdling scream. Allie had fainted as Sands sprang at the bull-like throat of Abaris, upsetting him in the suddenness of his attack. Lane stood petrified, Allie lay unmolested and unaided upon the floor.

"Just inside the chamber near the entrance, Sands and Abaris seemed locked in a terrible embrace of death. Chest to chest they lay on the floor, Sands on top, holding in his powerful hands the thin, rubber-like arms of the hideous, bestial-visaged ruler of the Jovians! Sands grunted as he strained hard to hold Abaris' flexible arms to prevent him from bringing into play the terrible weapon that seemed to be concealed in the sucker-like tips at their ends. It seemed like the conflict of two great forces—man and beast—in a terrible battle for supremacy—like good and evil, angel and demon. I

was thrilled at the great heroism of Sands and my heart swelled with the pride of having his loyal friendship. Slowly I edged my way toward the chamber, keeping well against the wall, for a closer view of the struggle. As uneven as it seemed, Sands, I thought, was the better of the two physically. But how could he hope to win such an unequal combat, unarmed, and against the terrible green death rays of Abaris? White man and planetarial beast! No greater contrast could be imagined.

"The muscles in Sands' neck bulged as he labored to hold the tough, flexible arms of Abaris. The Jovian's skinny legs, unjointed and stilt-like kicked spasmodically, poor protection against Sands' powerful limbs. From a better point of vantage I watched the struggle. Which of the two would win the terrible battle of physical forces?

"Suddenly Abaris gave a great heave that cast Sands clear from his barrel-like body! But Sands held, with bull dog tenacity, onto the writhing arms of the Jovian leader, struggling vainly to prevent Abaris from aiming his pencil-thin emerald rays of destruction. Once Abaris shot his terrible ray and a Jovian near him vanished entirely in a puff of acrid smoke! A ray struck one of the huge chairs and it crumbled. This combat, I felt, would be more like a wrestling match due to the fact that it seemed impossible for Abaris to rise on his stilt-like legs. That much in favor of Sands! But what would happen to him if Abaris succeeded in striking him with a green ray shot with uncontrollable anger?

"I studied Abaris' bestial features to see how he was accepting the terrific throttling he was receiving. His owlish orbs gleamed, flaming red, and stared bestially into Sands' set features, his terrible power of will burning into the man's brain. I cast a quick glance at Allie. She was just recovering from her faint and her father was at her side. From behind fluttering lids, Allie looked at the struggling figures, thrashing about on the chamber floor. She groaned softly and hid her face, sobbing.

"Watching them my muscles involuntarily became tense. My breath came in gasps born of sheer sympathy for Sands and his long lost sweetheart.

"Slowly, very slowly, the dominating will power of Abaris overcame the struggling physical force of Sands. Gradually he eased his terrible grip on the Jovian's writhing arms, and steadily Abaris was bringing their sucker-like tips toward his antagonist. Realizing his waning strength, Sands made a desperate effort to tear his eyes from the blazing, relentless orbs of Abaris, turning his head to the side. But struggle as he would, with all the physical strength at his command, he could not check the gradual domination of brain-power and will that was slowly but surely smothering him to submission.

"Presently Sands' muscles relaxed and finally the terrific power of Abaris' dominating will swept into the core of his brain, overpowering him. I cursed softly and hid my face in my hands for a second.

"Sand's head dropped to one side, his powerful arms hung limply. Blood streamed from his nostrils, caused by his tremendous physical efforts. I caught a glimpse of his eyes as his head fell. They were stark, unseeing eyes! His body shuddered convulsively as it slipped inertly to the chamber floor. Abaris was hoisted erect by two of his Jovians, his tubes waving victoriously, a cackling laugh in his throat.

"Allie Lane screamed and her father stroked her shaking head gently as Abaris strode, wobbling like a duck, toward them. I looked at Sands. His breathing was heavy and irregular. Abaris, I thought, had not killed him outright, nor had he brought into play his terrible rays. His great mental power alone had completely subdued him.

"Slowly my hand stole to the butt of my gun. With a jerk I snapped the weapon out of its holster, holding back the hammer with my thumb. In a space of several seconds I could have hurled five slugs at Allie and her father and the inert form of Sands. The sixth, I had planned, was to crash through my own brain. I levelled the gun at Allie's temple exposed through a wisp of her soft, brown hair, but I could not find the heart to release my thumb from the hammer. Suddenly I felt a wave of great remorse surge deep within me for not sending a half dozen shot into the owlish eyes of Abaris. Why hadn't I shot him as he lay there on the ground struggling under Sands, and clipped the writhing arms from his body? Was I actually the kind of a coward who would stand by, hiding like a frightened jack-rabbit while the life was being crushed out of my dearest and most loyal friends?

Alone

"A TERRIBLE rage filled me. What would my wife think of me back at Balch if she learned that I had stood idly by like a whipped cur and permitted those uncouth freaks to commit a wrong against Allie and her lover? How could my children ever live down the cowardice of their father! It was with these thoughts in my maddened brain that I suddenly dashed out of the tunnel, gun in hand, and blocked Abaris' passage toward Allie and her father. I felt a terrible urge to kill—to spill the blood or whatever it was that coursed through the veins of the frog-faced beasts!

"'Stop, Abaris,' I shouted hysterically. 'Stop where you are! I'll kill you if you move!'

"He stared at me through flaming, owlish orbs. His frog-like mouth opened and there came from his cavernous throat the mocking, cackling laugh. It was maddening—his cackling indifference! Suddenly remembering that it was within the power of these strange creatures to render my weapon useless, causing it to heat and burn my hand, I lifted the barrel from my hip and let fly. Swiftly and with the flaming desire to kill pounding at my brain I thumbed the hammer of my gun! In a row, six round, green holes appeared just above Abaris'

flaming eyes! He tottered for an instant and then recovered himself. An emerald green liquid poured from the holes and ran down into his owlish eyes.

"So rapidly were the slugs hurled from my gun that the Jovians did not instantly grasp their significance. Then abruptly the entire chamber seemed alive with thin green rays that played with deadly precision around me. Abaris, suddenly ill from the effect of the six slugs passing through his head, made a weak attempt to lift a tentacle-like arm. It was with an effort that he brought it up. I made a leap at him but I was too late. A ray shot from the tip of his fiendish arm! I felt a tingle on my left side, just over the heart. The chamber floor seemed to rush up as I fell, heavily. For several seconds I lay there, in full command of my faculties but unable to move a muscle. My head swam and I had a feeling that I was being hurled through space at a terrific speed. Then a terrible blackness overcame me and I seemed to be falling into a yawning abyss.

"How long I lay there I do not know. For ages, it seemed, I lay on my back making no attempt to move, but staring into an inky blackness overhead. What had caused the chamber to become dark, I wondered? Were my eyes really open? I pinched myself. I was not dead after all! I listened attentively for some sound to indicate the presence of someone. I heard nothing. The silence was awful. Then I wondered if I had succeeded in killing Abaris. If so, he should be lying at my feet. With an effort I wiggled a leg in an attempt to feel the floor near it. Perhaps Abaris had crawled away, or his men had removed him from the room, I thought. Then I remembered the futility of trying to kill a Jovian!

"I felt no pain although the blood pounded at my temples and I felt terribly weak and nauseated. My left side seemed numb—deadened where Abaris' ray had struck. Presently as I lay in the darkness, my ears caught a low moaning sound. Increasing in volume, the sound soon became a high-pitched wail like that which we had heard when we beheld the sphere whirling on the column in the center of the radium pool. My ear drums pounded under the force of the shriek and I placed my hands over them to shut out the maddening sound.

"Suddenly the whole earth seemed to tremble! A rumble filled the room as though the world were in the tumultuous throes of some great upheaval! With an ominous roar the floor under me shuddered and cracked. I lay panic-stricken, thinking that a terrible earthquake had swept over the Valley of Death. Crashing earth-slides roared around me as I lay helpless. Overhead I could see a thin streak of light penetrating through a fissure that was slowly widening! The chamber was becoming brighter under the glare of light that entered it from the fissure. I stood upon my feet and braced myself to keep from falling under the swaying movements of the earth. I looked around quickly. The chamber was entirely vacant. Not a sign remained of Abaris, his Jovians, Allie or any of them! They were gone! At my feet I noticed a spreading pool of green liquid. I cursed Abaris and his hideous followers roundly.

"Presently as I stood staring down at the liquid that must have poured from the wounds I had inflicted upon Abaris, I heard a terrific roar coming from somewhere near. The floor of the chamber rolled like the surface of an angry sea. I was dashed against the wall where I lay. I expected momentarily to see the chamber close up and crush me to death, sealing me in a living tomb deep beneath the Manalava Plain!

"There came a terrific, thunderous crash, the impact of which caused me to rise from the ground and fall again yards away! With the crash came the blinding flash of some terrible explosion. A great, hissing sound reached my ears and then I heard a loud, ear-splitting shriek. I looked overhead at the fissure in the earth through which filtered the soul-gladdening sun light. I caught a glimpse of a great sphere travelling at a terrific speed into the sky! As it sped away, the shriek of its passing became less discernible and soon died out altogether. The Jovians had departed for their own planet, taking Allie Lane, her father and Driftin' Sands with them! Gradually the earth roar ceased and with it ceased the earth's heaving.

"I stared around me now able to see the entire chamber. Not an object remained in it—not a fragment of any of the beautiful purple and gold drapes that had decorated the room which had been Allie Lane's. The Jovians had removed every object while I lay on the floor, apparently dead. Abaris' ray could not have struck me squarely, or else he had been too feeble and weak as the result of his wounds, to do more than stun me temporarily. In my rapid search of the room I discovered that the upheaval caused by the departure of the great interplanetary traveler, had sealed the tunnel in which I had hidden during the conflict between Sands and Abaris. The tunnel through which Abaris had suddenly appeared was likewise closed with massive rocks.

"As a last resort to escape from the underground world I began to study the possibility of crawling to the surface of the Manalava Plain through the wide fissure overhead. The opening was too high for me to reach up and obtain enough of a handhold to support my weight. I spent hours, working constantly, piling some of the broken rocks from the tunnels under the fissure. Eventually I succeeded in grasping a sharp rock protruding from the side of the crevice and hoisted myself up. It was hard, that climb to the outer world.

"Presently after what seemed hours of back-breaking labor I reached the surface. How good it was to breathe the pure air of Death Valley again! The atmosphere, in spite of the terrific heat of the Manalava Plain, was sweet and beautiful. My lungs, long since taxed with the foul, nauseating atmosphere of the tunnels and caverns deep below me, pumped madly, as I breathed in the delightful air of my own world!

"The Manalava Plain as far as I could see had strangely become ruffled and strewn with broken rocks. Wide fissures and crevices were visible at every hand and on several occasions as I picked my way off the Plain I was forced to leap over them or make wide detours in order to pass. After terrible torture I eventually reached the spring in the little hidden canyon. There I drank deeply of the water that had previously been pale green in color and was now strangely colorless. I looked around the weather-broken wagons and searched the old trunk that Sands had found before we started to follow the phantom wagon with its two mysterious humans, but failed to find anything in which I could carry a supply of water. After rolling in the spring I struck off across the Valley. It was hell, friends, and I would have lain down many times to die, but the ever present vision of my wife and youngsters over at Balch, constantly beckoned me to continue. So here I am and I thank you, gentlemen, for saving my life!"

* * * * *

CHAPTER IX

I Have Doubts

THUS ended the strangest and most fascinating narrative that I had ever heard in my entire career as a newspaperman. I sat breathless at the very fearlessness with which the man narrated it and I could not help but believe him. It seemed impossible for him to conjure in his imagination, in so short a time, such a weird story. It could not have been done even by the most versatile tellers of fabricated stories!

Long before he had finished his narrative, night had fallen and with it had come its myriads of brilliant stars glowing overhead. So entranced were Professor Bloch and I as he told it, that we failed to notice that the shrouds of night were lifting in the east as the sun cast its first vermilion rays into the darkened heavens.

Through the night the foreman had continued his tale uninterrupted and when he eventually finished, mumbling his thanks to us, the desert world had suddenly become brilliant with the everchanging colors of a desert dawn. I stared intently into the glowing coals of the camp fire, fascinated over the strange experiences he had unfolded to us. It was hard, very hard, to believe that tale, but somehow, it rang true. I shuddered at the thought of the grotesque Jovians and their uncanny powers.

The Professor remained silent lost in deep thought, apparently mulling over the story in his scientific way. I glanced at him quickly, expecting to see doubt written plainly on his features. Instead they were more serious than I had ever beheld them. The foreman hung his head in a stupor of exhaustion.

"Dowell!" Professor Bloch suddenly called to me as I sat staring into the fire. The abruptness of his voice caused me to jump nervously.

"Yes, Professor," I answered, very glad that the awesome silence which had settled over us after the foreman had finished his narrative, had been broken. "I'm very much awake, sir."

"My friend," said the Professor, seriously, "you have heard this gentleman's weird story. Tell me plainly just how you have taken it. Do not be afraid to express yourself."

"Well, Professor," I said, nervously. "It is difficult for a layman to accept such a story without basic facts, yet I feel that certain portions of it are true. Taking into consideration the fact that astronomers have just about proven that life exists on certain distant planets, it is not difficult to believe their assertions that its development there could be much further advanced than our own in scientific achievements. It seems quite natural that any form of life on Jupiter would differ greatly from our own due to atmospheric conditions and environment. As for radium, it seems quite possible that a great quantity of it would contain more qualities than are found in the small amounts of the metal that we have been able to obtain. However, in my opinion there seems to be but one factor in the narrative that has caused me to doubt a certain portion of it."

Pausing, I cast a quick glance at the mine-foreman. His head still hung in the stupor of exhaustion. He appeared to be sleeping soundly in a squatting position. I looked at Professor Bloch. He was regarding me thoughtfully, chin resting on his sun-tanned fists. Then I continued:

"It seems to me, Professor," I said, eyeing him, "that if the Jovians were immortal and could not be killed as this gentleman has related, there could be no existing skeletal remains. You say that Dr. Jamesson has recovered a huge skull. This man claims it fits perfectly with the facial characteristics of the Jovians. Under those conditions it is hard to accept that part of the narrative due to the fact that this man says that the Jovians cannot be destroyed and yet identifies a skull as being in exact conformity with the cranial structure of the terrestrial beings. How could it be possible to recover the skeletal remains of any creature that is allegedly immortal and therefore immune to death?"

"Your scientific observations and opinions, my friend," Professor Bloch said, enthusiastically, "are great for a newspaperman! I congratulate you! Your City Editor told me that you were the best hand on the *Outstander* at scientific matters and I believe him. However, I have gone over the narrative thoroughly and find in it the very same faults you have mentioned. But I actually believe this man told the truth! The green tint which marks his skin was undoubtedly caused by radium. I have seen radium affliction several times and its power discolors the human skin permanently when it is exposed to its rays for any length of time. I agree with you when you say that radium in large quantities must have more qualities than are known to exist in the small amounts recovered.

"As for the huge skull which Dr. Jamesson recovered. It is my opinion that the Jovians were not

entirely immortal—that is, when they are outside of their accustomed atmospheric conditions. It is easy to believe that they achieved immortality on their own planet, for we today, on this globe, are slowly approaching a period when longevity will be increased to an astonishing degree. It is my prediction that we, too, will some day have achieved immortality to a certain degree inasmuch as radium is already known to have removed the cancerous tissues of the human anatomy that cause death.

"However, I have reasons to believe that some of the Jovians were destroyed by the peculiar atmosphere of this earth when they arrived here. Naturally they could not be accustomed to our atmospheric conditions and results were that only the fittest survived the rigors of an alien planet. We must consider that years must have been consumed before they actually succeeded in locating the underground source of the radium deposit. Those who were unable to keep up the strenuous pace, weighted down by the earth's own atmosphere, were quite naturally cast aside. Some of them could not survive. Hence the skeletal remains recovered by Dr. Jamesson!"

"But, Professor," I argued, seriously, "How could they survive the slugs from this gentleman's gun? Such a slug as shot from his calibre of gun would kill an elephant instantly."

"That, my friend, is one of their secrets of immortality. I do not know how they could survive, I can merely hazard an opinion. This man narrated that a peculiar green liquid poured from the wounds. I am convinced, then, that a radium compound instead of blood, coursed through their veins with power enough to heal even the most gaping wounds instantly. Radium flowing through their anatomies would have the power to banish the leaden slugs even as they entered. The lead, like other lesser metals, would vanish into invisible atoms under the embrace of radium and would therefore have no more effect upon the Jovians than would pulverized dust. But great heat, alien atmospheric conditions or some tremendous violence, would actually destroy a Jovian if he were not of the most hardy sort. I feel certain of that, my friend!"

The Professor Makes A Promise

WE remained all that day at the camp by the Mesquite Springs. After a hurried breakfast we lay down and slept until late afternoon. The heat was terrific and it beat down upon me with deadening effect. I slept through it, dreaming terrible dreams. Eventually I was awakened by Professor Bloch who had already prepared a light lunch. The mine-foreman was holding a pan of sizzling bacon over a tiny fire while the Professor set other victuals on the tail of the buckboard. I rubbed my eyes sleepily and tilted my hat forward to keep the burning sun from searing my face.

"We almost left you, Dowell." Professor Bloch laughted, good naturedly. "You were sleeping so sound and dreaming so pleasantly that I hated to disturb you, but our friend here thought it best to take you along."

"I'd just as soon die from the heat there, I guess, as melt completely here. Let's eat! I want to get back to Los Angeles. The City Editor is reserving a room for me in the ice-house!"

"Very well, we're starting now."

Immediately after lunch we started across the Valley toward the mysterious red streak of tableland that marked the Manalava Plain. For hours we rode in the bouncing buckboard—for hours, it seemed, we walked along side of it to relieve the laboring animals. The sun beat down with terrific intensity and the heat waves danced blindingly from the sand.

Eventually we found it necessary to continue on foot, leaving the burros and the buckboard in a little, partly sheltered arroyo. About noon we arrived at what the foreman claimed to be the spot where he and Sands had located the radium pool. The surface of the Manalava Plain was a jumble of broken rocks and a maze of wide crevices. We stared at a deep crater-like depression before us but it was void of anything in the form of liquid. Nothing but boulders lay in its basin and the sides had crumbled in steep, loose rock-slides!

For what seemed ages, we searched around the surface for some opening that might lead us down into the deserted tunnels and chambers of the Jovians. None could be found. Evidence of some great, recent upheaval was everywhere and search as we did we could locate no avenue by which we might enter the strange underground world.

Presently Professor Bloch decided that the underground domain had been destroyed completely by the upheaval, caused no doubt, by the tremendous force of the radium in propelling the space-traveler from this earth. Disconsolately we trailed back to the buckboard.

When we eventually returned to Los Angeles, Professor Bloch refused to make a public statement regarding the foreman's strange experiences, and I was henceforth unable to submit the narrative for publication in the *Outstander*. I did, however, write an account of Dr. Jamesson's discovery of the peculiar skull and hinted indirectly at its remote connection with the chain of evolution on this globe, and the possibility of this world being invaded at some future period by Martians, Jovians or Venerians, but the *Outstander* published only a few garbled paragraphs that were unintelligible and valueless. And for many months I have secretly withheld the narrative until at last I have mustered courage enough to submit it for publication to a scientific journal. Readers of SCIENCE WONDER STORIES usually can tell fact from fiction. They know well that many unheard of tales come from the vast jungles of desert wastes and invariably they are true! One thing Professor Bloch did say, was that if money and inventive skill could be obtained an attempt might be made to go to Jupiter to rescue the unfortunate trio. If such a thing were to happen I will be one of the crew.

THE END

The Problems of Space Flying

By

CAPTAIN HERMANN NOORDUNG, A.D., M.E.,

(BERLIN)

Translated from the German By Francis M. Currier

© 1929 By Gernsback Publications, Inc.

IT is quite certain that Captain Noordung's preceding articles on "Space Flying" have proven revolutionary. If the letters from our readers are an indication of what the rest of the scientific world thinks of these articles, we feel sure that they will prove prophetic in the years to come.

In this concluding installment, Captain Noordung proposes some further revolutionary thoughts, the most outstanding of which probably is his "Giant Floating Mirror," perhaps the most frightful weapon ever conceived by man.

And it should be noted that as in his preceding articles, the final installment is based upon pure scientific reasoning and there is nothing contained in any of the articles that will not come into actuality sooner or later. As a matter of fact, all of the instrumentalities so vividly depicted by this gifted and noted German engineer, could be constructed today if a sufficient amount of money were forthcoming.

CHAPTER VIII (Continued)

The Investigation of the Stars

DISTANT observation from the spatial station opens the most splendid prospects for astronomy. In this case also there is the possibility of using telescopes of any desired size, beside the advantage of having the radiation of the stars reach us unchanged. The blackness of the sky would also help, by its contrast, the observation of the radiation of stars.

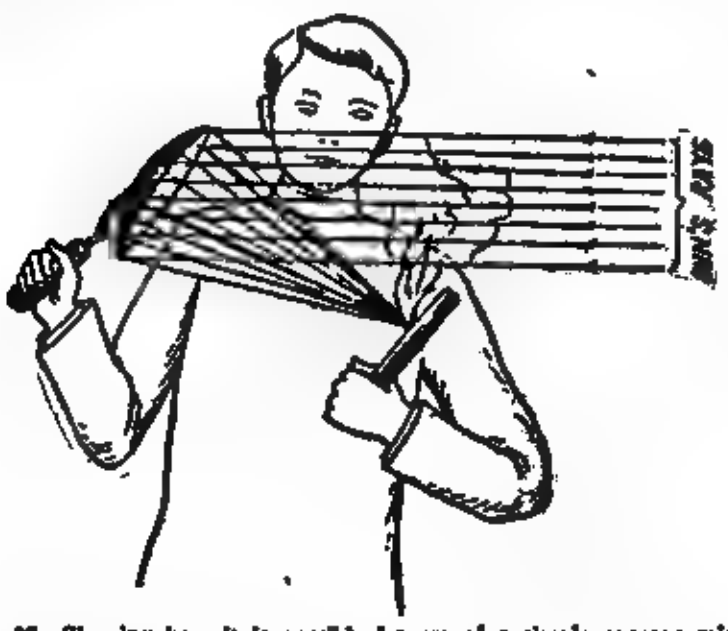


Fig. 37—Showing how it is possible by use of a simple concave mirror to converge the sun's rays on an object and so ignite it.

This latter circumstance would permit all those observations of the sun (which from the earth are possible only at total eclipse) by simple exclusion of the sun's disk through a round black shield.

Our entire solar system, with all its planets, asteroids, comets, big and little moons, etc., could be investigated in the minutest details. Even Venus and Mercury, the two "inferior" planets (that is, nearer to the sun than the earth) could be observed just as well as the "superior" planets (those farther away than the earth). From the earth, as we have remarked, this is not possible because of the phenomenon of twilight. The surfaces of all the neighboring heavenly bodies, the moon, Venus, Mars, and Mercury, could be closely examined so far as they are visible to us and could also be mapped by *telephotography*. Even the question of the habitation of the planets might probably be definitely decided.

The most interesting discoveries, however, would doubtless occur in the realm of the fixed stars. Many an unsolved problem of these extremely distant bodies would be explained. Our knowledge of cosmic events would be increased so far that we could, with absolute certainty, decide about the past and also the future fate of our own solar system and the earth.

All these researches would have, besides their other significance, the greatest importance for the further development of spatial navigation. Once we know exactly the conditions in those realms of space on the heavenly bodies, a flight into space would no longer be a trip into the unknown for much of its peril would be lost.

CHAPTER IX

A Giant Floating Mirror

YET the possibilities of an observatory in space are not yet exhausted. From the fact that the sun shines not only in infinite power but also uninterruptedly (aside from short chance passages through the shadow of the earth), use might be made also for many technical uses on earth. From the spatial station itself, the sun's rays, even on the greatest scale, could be artificially directed upon various regions on the surface of the earth by properly constructed giant floating mirrors, circling about the earth in free orbits and thus floating above it, as proposed by Oberth.

According to his suggestion, they should consist of separate facets which are so arranged in movable fashion that from one point by means of electrical influence they can be given any desired po-

sition with regard to the level of the entire mirror. By proper adjustment of the facets it would then be possible to spread the entire solar energy reflected from the mirror according to needs over wide expanses of the earth's surface, to concentrate it on individual points; or finally, when it is not needed, to let it radiate into space.

Fig. 18—How the giant mirror in space proposed by the author may be used to give perennial daylight to the earth. The mirror is on the side of the earth that is turned away from the sun. The sun's rays strike it and are reflected to the earth or any part of it, where the concentration of the rays produces the equivalent of the direct light and heat of the sun.

The fact that such spatial mirrors would be weightless because of their motion in orbits would materially simplify their manufacture. According to Oberth a circular wire network is to serve as a frame, being spread out in space, for this purpose, by rotation. In its meshes the separate facets would be placed, consisting of sheet sodium as thin as paper. According to his estimates such a mirror with a diameter of 100 kilometers would cost about $750,000,000 and would require about fifteen years to construct.

Besides this, there would probably be other possibilities of building such a giant floating mirror. With smaller diameters of only a few hundred meters, it would be possible to give the entire mirror so rigid a construction that it could be turned in its entirety about its center of gravity by means of rotary motors and could be given any desired change of position.

The electrical energy needed for guiding such mirrors would be amply available in the spatial observatory. The guiding apparatus itself would have to be in the observatory proper, so arranged that it could be used during simultaneous observations through the giant telescope, so that it would be possible to direct most exactly the illumination of the mirror on earth.

The use of this equipment would be manifold. Important harbors or airports, great railroad stations, even entire cities could be illuminated at night, cloud conditions permitting, by natural sunlight. How much coal could be saved, if for example Berlin and the other great cities were illuminated in this manner!

The Most Frightful of Weapons

THIS mirror, like every technical achievement, could also be used for the purposes of warfare and, what is more, it would provide a weapon far surpassing in frightfulness everything thus far used.

It is common knowledge that very considerable temperatures can be produced by concentrating the sun's rays with a concave mirror (such as with the aid of a burning glass). Even if the mirror is no larger than a hand, it is possible to kindle directly pieces of paper, even such things as shavings of wood, etc., which are held at its focus.

If we now assume that the diameter of such a mirror is not merely ten centimeters but several hundred or even thousand meters, as would be the case with a mirror in space, then steel would melt, and even incombustible materials could hardly resist permanently, if sunlight, so tremendously concentrated, struck them.

And assuming that the observer in space, with the aid of his mighty telescope, saw spread out before him the entire field of battle, with the country behind the lines of the enemy, with all his routes of approach by land and sea, all this like a gigantic map showing even the smallest details. Then we can form an idea of what such a spatial mirror, guided by his hand, would mean as a weapon!

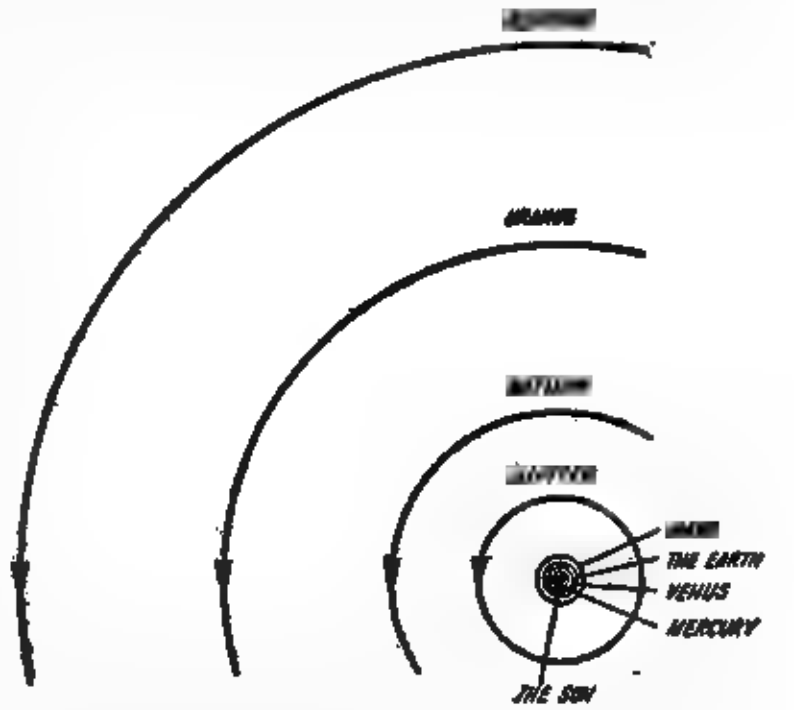


Fig. 19—Showing the sun and the orbits of the sun's planets. This indicates the relative distances of the various planets from the sun. The four minor planets, Earth, Mars, Venus, and Mercury, are only a fraction of the distance that the four major planets are from the sun.

By using it there would be no difficulty in blowing up the munition dumps of the enemy, setting fire to the depots of his supplies, and melting his cannon, armored turrets, iron bridges, the rails of important railways, etc.

Moving trains, factories important for war, even entire industrial establishments and great cities could be burned. Troops on the march or in camp would simply be carbonized, if the bundle of rays of this concentrated sunlight were passed over

them. And the ships of the enemy, no matter how powerful they were or how strongly fortified the harbors in which they sought refuge, could not possibly be protected from it. They would be destroyed—burned out as we eliminate vermin from their hiding places with the blast flame.

These would be actually the rays of death! Yet they are no other than the life-giving ones which we daily desire from the sun. In this case, however, we would have "a little too much of a good thing."

Yet matters would scarcely come to all these horrors. No power would ever venture to begin a war with a nation having control over such frightful weapons.

CHAPTER X

To Distant Heavenly Bodies

IN our previous considerations we have not dealt with travels beyond the realm where the attraction of the earth is paramount. How are matters with regard to the real purpose of the journey in space, the complete separation from the earth and the reaching of distant heavenly bodies?

First, let us briefly view the stellar universe as it will be viewed from the standpoint of spatial navigation, i. e., as future realms to travel. We must therefore change and enlarge our mental outlook. For if we wish to regard the entire cosmos as our world, then what has hitherto seemed to us to be our world, the earth, will be our home in the narrowest sense. Not the earth alone! All else that is bound to it by its gravity, such as the future station in space and even the moon, must also be reckoned as part of our narrow home in the universe, as belonging to the realm of the earth. After all, how small the distance from the earth to the moon is (some 380,000 kilometers), compared with the other distances in space! It is only a hundredth of the distance of our nearest planets, Venus and Mars. And the sphere that would be made by the moon's orbit around the earth could easily find room inside the sun.

The first unit in space to consider beyond our earth is the solar system, with all the various planets belonging to it. There are eight principal planets, of which our earth is one, together with numerous other heavenly bodies. Most of the latter, the asteroids, periodic comets, meteors, etc., are of small size. Of the planets, Mercury is nearest the sun; then follow Venus, the earth, Mars, Jupiter, Saturn, Uranus, and finally Neptune. Accordingly Venus and Mars, along with the moon, are the direct neighbors of the earth.

All these heavenly bodies are permanently bound to the sun by the power of mass attraction, and compelled constantly to revolve about it, as a centre, in elliptical paths. They form the realm of the *fixed star*, the "sun." Illuminated and warmed by the splendor of its rays and also controlled by the steadfast might of its gravitational pull, they are joined in eternal union, an island in the emptiness and darkness of space. Such is our "greater home" in the universe—the solar system. This is a realm, indeed, of tremendous size: even light, though it hurries through space at the speed of 300,000 kilometers a second, takes more than eight hours to cross it directly.

Yet how tiny is this world as compared with the incomprehensible extent of the universe from which many heavenly bodies, the fixed stars, heated even to a gaseous state, send us the greeting of their shining rays. Even the nearest of them, *Alpha Centauri*, is 4.3 light-years away, that is, about 4,500 times as far as the diameter of the whole solar system! All the others, however, are much farther from us, most of them hundreds and thousands of light-years. And if there were already extinguished fixed stars nearer us, in the eternal darkness of empty space, we could never see them.

From this it is already apparent that, as for travelling to distant heavenly bodies, we can now take into account only those belonging to the solar system.

The Technique of Travelling

THE manner in which distant travel through space would have to take place would, in general, be in free orbits about those heavenly bodies in whose paramount fields of attraction the trip takes place. Within the realm of the sun, therefore, we must move around the latter always in some sort of free orbit, if we are not to become subject to its gravity and plunge into its sea of fire.

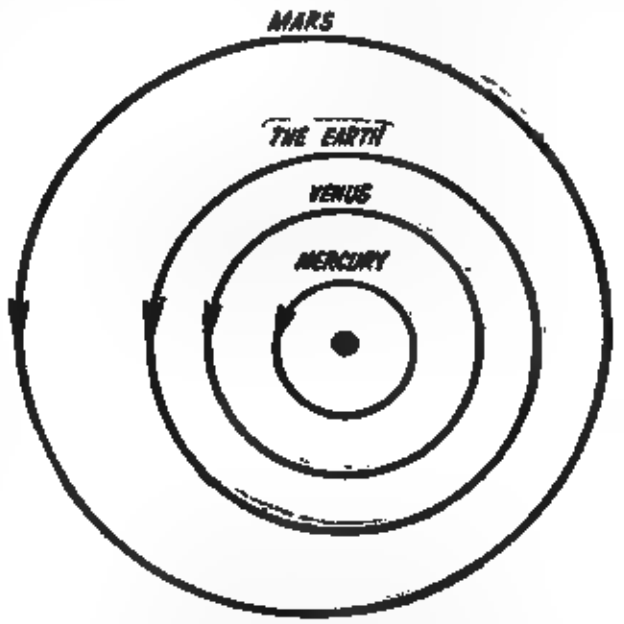


Fig. 40—Showing the sun and the orbits of the four minor planets, Mercury, Venus, Earth and Mars. This indicates also the relative distances of the orbits from each other.

Certainly we need not pay special heed to this point as long as we remain in the narrower realm of the earth or of some other world in the solar system. For each of these revolves about the sun in its own free orbit, so to speak, and with it at the same time, and because of it, all the bodies belonging to it. With the earth, whose speed is 30,000

meters a second, there also revolves the moon at present; and there would revolve our future station in space (the moon and the station being both satellites of the earth). All of these bodies, going around the sun, its attraction thereby loses its direct effectiveness on them. (This is called "the stable condition of floating" as regards the sun.)

Only when the space ship passes out of the narrower region of attraction of one of the heavenly bodies, revolving around the sun, would it have to travel around the sun in a free orbit of its own. For example, if it is a question of a trip from the earth to a distant planet then, on the basis of what has been said, not only the course of this independent path *but also the time of departure from the earth must be so chosen that the space ship arrives at a point in the orbit of the planet to be visited at approximately the same time as the point is passed by the planet itself.*

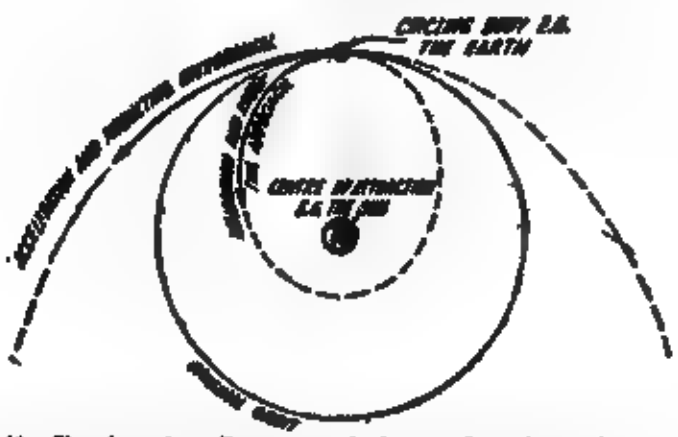


Fig. 41—Showing the effect on a body rotating about the sun of a change in its velocity. If the speed of the body, such as the earth, is accelerated it will withdraw from the sun to a new orbit. If the speed is retarded it will approach to form a new orbit.

If the ship is thus brought into the region of attraction by the planet to be visited, then the possibility is open of either circling it in a free orbit as a satellite as often as desired or descending on it. In case the planet has a blanket of air, like that of the earth, the landing can be by a method already considered for landing on the earth (Hohmann's landing manoeuver by use of decreasing ellipses). If a blanket of air such as the earth possesses is missing, then the landing can be effected only by recoil-braking—making the force that operates the ship work in the opposite direction to the direction of fall during the descent.

In order to journey within the solar system to another heavenly body, after successfully getting free from one, it would be necessary to change the orbital motion (which we would have previously acquired around the sun along with the original planet) by the assistance of the propelling force. Thereby, we would enter an independent orbit about the sun, this serving as an intermediary orbit to join the orbit of our own planet with that of the other. According to the laws of celestial mechanics, for this purpose, the original orbital motion must be altered according to the location of the goal; that is, it must be accelerated, if the ship is to go away from the sun, and retarded, if it is to approach the sun. Finally, as soon as the desired heavenly body is reached, the independent motion of the "connecting orbital path" must be changed to that which the ship must take in relation to the new planet in order to carry out the manoeuver of circling about it or of landing. The return trip would have to take place in the same way.

It is accordingly clear that in the course of such a distant trip through planetary space, repeated changes in the condition of motion are necessary. These must, each time, be effected by propulsion with artificial power and therefore require the expenditure of fuel. This expenditure, according to Hohmann's calculations, is least when the orbits of the original planet and that to be visited are not cut by the connecting orbital path of the ship but are merely touched by it.* In any event, the necessary amounts of fuel are considerable.

Still greater amounts must be added if the planet to be visited is not to be circled about but actually landed upon directly. The amount of fuel needed in fact increases with the mass of the planet and accordingly with its power of attraction. This is understood when it is considered that ascending again from it in starting the return trip requires a very considerable expenditure of energy, as is already known from such an ascent from the earth. If, furthermore, the braking on landing must be done by means of the propulsion (recoil braking), in the absence of a suitable atmosphere, then there results a further tremendous increase in the necessary fuel.

Moreover, this fuel must all be taken along on the trip from the earth, at least on the first visit to a remote planet; for we could not count beforehand on being able to secure there the fuel needed for the return trip.

CHAPTER XI

The Start from the Surface of the Earth

TO commence such a trip directly from the surface of the earth, and to overcome its gravity, it would be necessary to also lift this whole supply of fuel. According to previous remarks, this of itself demands a most extraordinary expenditure of work.

In the case at hand, at least with the efficiency of fuels now available, the amount necessary to be taken along would accordingly make up so great a part of the total weight of the ship that its construction would be hardly possible.

The only visit to a heavenly body which could be undertaken directly from the earth's surface by means of fuels known now would be the circumnavigation of the moon, for the purpose of a closer observation of the nature of its surface, especially on the side of it always turned away from the earth. In the course of this, we could be "imprisoned" by the moon, to circle about it as often as desired in a

* In other words, if the ship moves tangentially to the orbit of the planet it leaves and takes a path that brings it tangent to the orbit of the new planet, the energy required would be a minimum.—*Editor*).

free orbit, like a satellite of the moon. The amount of fuel needed for this undertaking would not be much greater than for a normal ascent from the earth to the practical limit of gravity.

The Spatial Station as a Basis for Spatial Travel

THE conditions would be considerably more favorable, however, if (as Oberth proposes) a fuel depot were constructed, floating at a proper height above the earth and constantly circling about it in a free orbit, to serve as a starting point for the trip instead of the earth. In this case only a slight expenditure of work would be needed to be entirely free from the earth, and the ship would accordingly not need to be loaded with the fuel necessary for the ascent from the earth. Only a little more would need to be taken along than would be required for the distant trip itself.

Since the depot, as a result of its free orbital motion, would be weightless, the fuel could simply be placed there in any amount, freely floating at any point in space. If protected against the rays of the sun, even oxygen and hydrogen could be kept indefinitely in a solid state.

The supplying of it would have to be managed by a constant travelling of space ships, back and forth. This might be from the earth or from the moon. In the former case, the fuel (at least so far as it consists of liquefied oxygen and hydrogen) could be produced in great power plants operated by the heat of the tropical ocean.

The moon would be an especially advantageous base, as Max Valier suggests. There the mass, and accordingly the force of attraction, are much smaller than those of the earth, which would greatly lessen the expenditure of work needed for the ascent and therefore for the carrying of fuel from it. Certainly this presupposes that the necessary raw materials are actually present on the moon; that is, that there is at least water (even in the form of ice). The latter would be electrolytically decomposed into oxygen and hydrogen, the required energy being provided by solar power plants. Unfortunately the probability of this is not too great.

If it should be the case, however, we could use the moon also, as Hohmann suggests, for the starting point of spatial travel and accordingly make the fuel depot on it.

In spite of the many advantages of this plan, Oberth's proposal of a freely floating depot seems more favorable, because, from it, the complete release from the field of attraction of the terrestrial region (including the moon) would demand a considerably smaller expenditure of energy. Indeed, from the standpoint of economy and energy, it would be doubtless most advantageous to establish the depot one or several million kilometers from the earth, especially if the fuel has to be transported to it from the earth.

We shall nevertheless transfer it to our station in space, making the latter thereby the base for the travelling, because it is already supplied with all the equipment necessary.

An especially important part of the equipment would be the giant telescopes. Thanks to their almost unlimited efficiency, they would make it possible; first, to examine minutely, from a distance, the regions to be travelled in the stellar world. Furthermore, the space ship could be kept under constant observation during a large part of the trip, and frequently during the whole of it. By means of light signals shown by the ship at appointed times there could be a communication, at least, on one side.

Thus, the spatial station, aside from the many duties already mentioned, would be able, not only to initiate real travel about the universe, but also to serve as an operating base for all spatial journey.

The Accessibility of the Neighboring Planets

HOHMANN has thoroughly investigated the problem of visiting other heavenly bodies. According to his results, expressed in terrestrial chronology, the trip from the earth to Venus would last 146 days and that to Mars 235. A round trip including circumnavigation of both Venus and Mars at the relatively slight distance of about eight million kilometers could be performed in about a year and a half. For visiting Venus and landing upon it, including a stay of 14½ months, together with the trip there and back, not quite 2¼ years would be required.

Let us assume that the journey is to commence according to our previous observations from the spatial station, so that final release from the field of gravity of the earth would require only a little energy. The return takes place directly to the surface of the earth, so that no energy at all need be used for this. One can descend merely with braking by air resistance. Let the weight to be transported be two persons together with the provisions needed for the entire trip and all the apparatus required for observations and other purposes.

Hohmann calculates that the space exploring ship ready to start, provided with all the fuel necessary for the trip both ways, must weigh approximately as follows: for the previously mentioned round trip including circumnavigation (not landing) of Venus and Mars, 144 tons, 88 per cent of this being fuel; for the first landing on the moon, 12 tons; on Venus, 1,350 tons; on Mars, 624 tons. In the first of these three cases 79 per cent, in the other two about 99 percent of the entire weight of the ship would have to be fuel. The expulsion speed of 4,000 meters a second from the earth is assumed.

It is clear that the construction of a ship to carry rocket propulsion fuel making up 99 per cent of its entire weight would present such considerable technical difficulties that its manufacture could hardly succeed at present. Accordingly, only the moon, of all the larger heavenly bodies next to us, could at present be in question for a visit including a

landing. However, we could at best approach very near the planets and circumnavigate them, without however landing on them. Still we have hope, that in the course of time by the aid of the principle of sectional construction, we may finally succeed even with the technical means known today in constructing space rockets which can even execute landings on the neighboring planets.

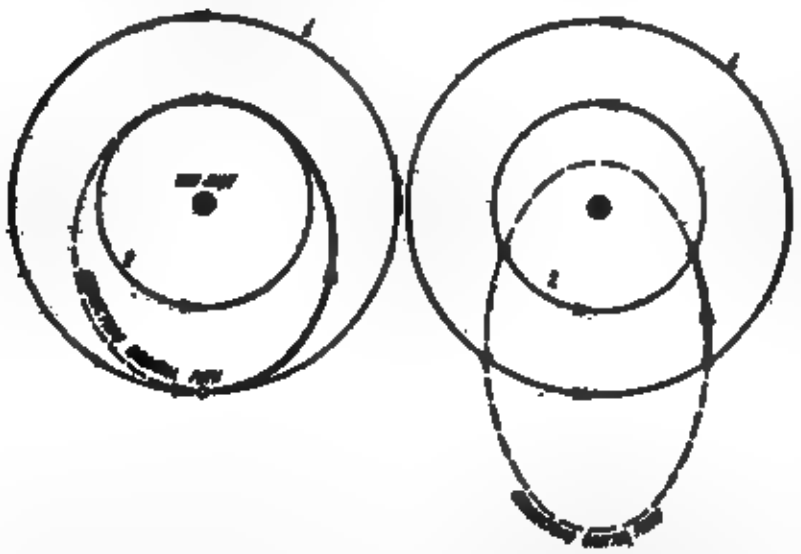


Fig 49——Showing two ways that a body can travel from one planet to another. [illegible] way shown on the left, which is the easier, the body leaves the planet on a tangent to its orbital path and travels so that it approaches the orbit of the next planet on a tangent to its path. The smallest amount of power is required for this. By the second method, shown on the right, the body is forced to cross the orbit of one planet to get to the other. This would be necessary if the calculation as to the path to take in space has been badly done. This method takes a greater amount of power than the first, for the body is forced to travel further away from the sun and therefore overcome for a greater distance, the sun's gravitational pull.

Doubtless this exhausts all the possibilities which seem to be offered to spatial navigation in the present state of science. For the difficulties would be far greater which confront a visit to more distant planets of the solar system. It is not merely that the routes to be travelled are far longer than those hitherto considered. Since all these planets are at greatly different distances from the sun than the earth, in reaching them, the field of gravity of the sun plays a considerable part. This attraction would have to be overcome by energy. If for example we travel away from the sun (i. e., "ascend" from it), we must overcome its pull exactly in the same manner as when we travel away from the earth. This is shown in the previously mentioned change in orbital speed about the sun, necessary in distant travel through planetary space.

But if we wished to descend on one of these planets, tremendous amounts of fuel would prove necessary, especially in the case of Jupiter and Saturn. These, in consequence of their enormous masses, possess very powerful fields of gravity.

As for reaching the fixed stars, their extreme remoteness alone makes them impossible of consideration.

Distant Worlds

THIS does not affirm that we must for all time remain confined only to the region of the earth and the neighboring planets. If we succeed in increasing the repulsion speed in recoil action beyond the amount of 4,000 or perhaps 4,500 meters a second, thus far reckoned the highest practically attainable; or if we find a possibility of storing very great amounts of energy in a small space, then the situation would be entirely different.

And why should not the chemists of the future develop a propelling material far surpassing in effect those already known? It is even conceivable that in time we shall succeed in making technically serviceable, and in using to propel space ships, those tremendous amounts of energy confined in matter—energy whose existence we already know. Perhaps we shall also find a method of using, for this purpose, the electrical phenomenon of cathode radiation or by some other way to attain a tremendous increase in repulsion speed through electrical influence. There might, lastly, come into question a suitable use of the sun's radiation or of radium decomposition, etc.

Certainly natural possibilities for future investigators and inventors are still plentifully available in this respect. If success should result, then we could visit and actually set foot on many of those far-off worlds which, as yet, we only view at immeasurable distances in the starry heavens.

An ancient dream of mankind! Would its fulfillment be of any use to us? Certainly science would make extraordinary gains. No certain judgment is possible today regarding the practical value. How little we know of even our nearest neighbors among the heavenly bodies!

The moon, still a part of the region of the earth, our "narrower home" in the universe, is, of all the distant heavenly bodies, the one best known to us. It is cold, has no covering of air, and is without any higher form of life. It is a gigantic mass of rock floating in space, fissured, inhospitable, rigid in death—a world of the past.

But we have considerably less knowledge regarding the body next best known to the moon, our neighboring planet Mars. But in comparison with our knowledge of other planets our knowledge of Mars is considerable.

Mars, too, is an aged world, though not nearly so old as the moon. Its mass and therefore its force of attraction are both much less than those of the earth. It has, indeed, a covering of air, yet of far less density than that of the earth. (On its surface the air pressure is certainly considerably lower than even on our highest mountain tops). Apparently, it possesses water. A fairly large part of this may be frozen; its mean temperature seems to be much below that of the earth, even if in places, as on the Martian equatorial belt, comparatively high temperatures have been determined. Because of the thinness of the atmosphere, the differences in temperature in the day and at night are very great.

The strangest and most discussed of all Martian observations in the phenomenon of the so-called "Martian canals." Even though recently they are often regarded as merely optical illusions, we really know nothing about them.

At any rate, what we already know about Mars does not offer us enough clues to be able to form a final judgment as to whether this planet is inhabited by intelligent creatures or by any creatures at all. It would hardly be habitable for persons from the earth, chiefly because of the rarity of its atmosphere. Therefore it would offer spatial navigation an extremely interesting object of investigation from the scientific standpoint. But whether landing there would have practical value as well cannot be recognized today with certainty. It hardly appears likely however.

It is another matter with our second neighboring planet, Venus, a splendid, shining, heavenly body, known to us as "morning star" and "evening star." Its size, its mass, and therefore the force of gravity prevailing on its surface are only slightly less than those of the earth. It also has a covering of air, doubtless very similar to ours, though somewhat deeper and denser. Unfortunately Venus is hard to observe from the earth, because it always appears near the sun and therefore is only visible at twilight. Accordingly we are still entirely uncertain about its rotation on its axis. If its period is approximately that of the earth, about twenty-four hours, as is widely assumed, then Venus and the earth would have a marked resemblance.

It is, therefore, with this planet that we may most reasonably count on finding conditions of life similar to those on earth, even if the suspicion, that it is always covered with clouds, should prove correct. Even on the earth there was a highly developed life of plants and animals at a time when part of the water, now filling the oceans, was still in the form of vapor. Certainly, of all the heavenly bodies known to us, Venus offers the greatest likelihood of being suited to occupation and thereby of coming into question as a future goal of travel. Since it is also the nearest of all the planets, it might well be the most enticing object for spatial navigation.

Mercury, being still nearer the sun, offers even less favorable conditions of observation than Venus. It is the smallest of all the planets, having a covering of air, which is probably only extremely thin, and a surface apparently similar to that of the moon. For these reasons and especially because of its closeness to the sun (the solar radiation is about nine times as strong as on earth), extremely unfavorable temperature conditions must prevail there. Mercury would accordingly be hardly at all inviting as a place to visit.

Although, in considering the previously mentioned planets, it was possible to arrive at a fairly probable result, what we so far know is insufficient for the purpose in the case of those more distant, Jupiter, Saturn, Uranus, and Neptune. We have, indeed, been able to determine that they all have dense coverings of air. The question of the nature of the surfaces of these planets is, however, still entirely uncertain. With Jupiter and Saturn this is because they are so densely enveloped by condensation products (clouds of some sort or other) that we apparently do not see their real surfaces at all. In the cases of Uranus and Neptune, it is because their extreme remoteness prevents more exact observation.

Concerning their value as goals for space travel, it is difficult to say anything. Yet, merely the circumstance that we have determined, in the case of these planets, a relatively low average density (from 1/4 to 1/5 of that of the earth), leads to the conclusion that a very different physical condition must exist from that of the earth. This alone must greatly lessen our expectations of a visit.

Still, it would perhaps be possible that some of the satellites of these planets (more especially those of Jupiter) would offer comparatively more favorable prospects.

One thing is absolutely certain: the mass and consequent force of the field of gravity of each of these planets, being tremendously greater than those of the earth, would make visiting them ex-

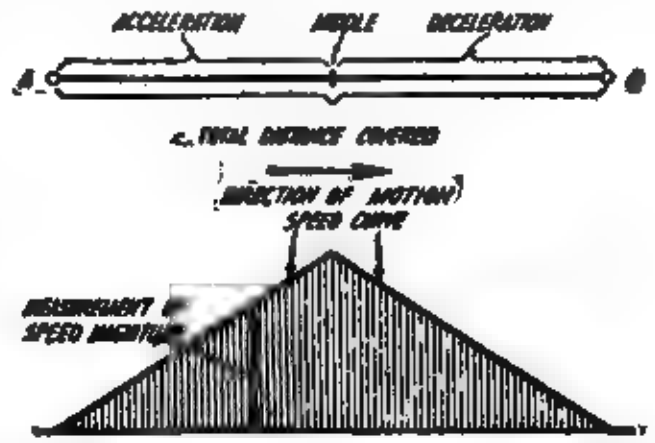


Fig. 43—A speed curve showing the method of acceleration and deceleration in going from point a to b. The body is uniformly accelerated from rest until it reaches maximum speed halfway between a and b, then it is uniformly decelerated until it comes to rest at b.

traordinarily difficult, especially in the case of Jupiter and Saturn.

Regarding, finally, the various other bodies belonging to the solar system, it is reasonably certain today that we could hardly derive any special practical benefit from visits to them.

We see, therefore, that we may not be too optimistic about the advantages to be expected of other members of the solar system. But thus far, we certainly know far too little not to let our thoughts have a free rein in these respects.

It might well be that all these worlds will prove to be entirely worthless to us. On the other hand, perhaps we would find on many of them a fertile soil, plants and animals, possibly of a sort entirely odd and strange to us. They might even be of gigantic size, like those once existing on the earth. Indeed, it is not incredible that we might find even human beings or similar creatures, maybe even possessing civilizations very different or even older than those of our ative planet.

It is even highly probable that life on distant planets, in case it exists there, is on another level than that of the earth. Then we could experience the marvel of viewing conditions from the evolution

of our earthly existence: conditions of the present time, real and living, yet pictures of a past or future countless millions of years away.

Or it might be that we would find valuable substances which are very rare on earth, such for example, as radium, occurring in an easily obtainable form.

If the conditions of life discovered there were suitable for permanent occupancy, perhaps then (incredible as it may sound today) distant planets would in the course of time come into question for emigration and colonization.

As we have remarked before, there is little likelihood that there are such suitable planets among those of our solar system, with the single exception of the planet Venus.

THE END.

The Onslaught from Venus

(*Continued from page* 343)

the second line dived below them and the third drove head on into the enemy air formation.

It seemed as if the entire atmosphere of the world blazed and flamed for a split second. The three front lines, somewhat shattered, readjusted themselves to normal formation. And my own line was driving through acrid smoke, as below me fell away the grotesquely twisted fragments and wreckage of "umbrella" ships and planes. I took my hand off my guns. There was nothing to shoot at. There were no umbrella ships left.

And a few seconds later our great "sheet" of planes swept down low in an undulating dive and drove along, strafing the struggling and disordered formation of the enemy.

It was kaleidescopic. Our speed was terrific. Twenty thousand heavy calibre machine guns spat forth an instantaneous blanket of flaming death that pinned down the invaders by untold thousands. Here and there fan-ray machines raised fluttering, futile, pale canopies of would-be protection. But our shells were not of metal now. Great lumbering masses of machinery, heaved and plunged along on their queer lever-like legs, only to tumble ponderously into great shell holes, or suddenly shiver and tremble like living things, then settle down with a weakly waving metal "leg" or two, and "die."

As suddenly as I was plunged into it all I found myself out of it. Subconsciously following the line ahead, I had zoomed and looped my way into the comparative peace of a higher level. Automatically my brain registered the signals clicking in my ear phones, and I found myself streaking for a new rendezvous preparatory to a second attack.

But we never delivered that attack. We were called off. The enemy mob, which no longer could be designated as an army, was plunging frantically against our new ground positions, and for miles along that line unyielding regiments of infantry stood off the hordes of an alien planet.

The End

WE saw little of what followed. To us there were vague, hazy, scattered movements of large and small detachments of troops, and the interminable ripping and rumbling of barrages. Little more was visible from our height.

But there is no need for me to tell how the high command, finding that our lines actually had checked the demoniac fury of the Venus lunges, and knowing their entire army was in disorder, threw all available reserves into the fight, even going to the extent of arming the girls' regiments in the auxiliary services, and hurling them into the welter; how the divisions of Earth surged forward, shooting, hacking and thrusting their way irresistibly through the invaders until to the last man and woman they were beaten and hunted down to that death which they preferred to surrender. For there already exists a voluminous history of that particular phase of the struggle.

I have often wondered at what place and time during this great struggle the Venus girl Nyimeurnior met her end, and the old "miorurlia" who learned English from me. And I have often wondered too at that peculiar lack of sympathy with which my memories and my speculations as to their possible fates are tinged, for I am not by nature an unsympathetic man. There seems to be no other explanation for it that I can find than a fundamental planetary antagonism.

These people of Venus were intelligent beings, much like us of Earth in appearance and in many physical respects. Yet I could not feel for them the friendliness that I would feel for a dog, cat, yes, even for a familiar insect of this earth.

I am convinced that the civilized nations would have extended them aid and mercy as a matter of principle, even after we had experienced this peculiar repulsion upon actual contact with them. They would have been given a section of the world they could occupy in peace and relative comfort—the almost uninhabited jungles in which they tried to establish themselves for instance—had they not blindly insisted on precipitating a struggle that could end only with their extermination.

But perhaps there is some little understood law of the Universe that was only proving itself in this case. These people of Venus did not belong on Earth. And though they showed super-ability and super-power in crossing the barriers of space, and in maintaining themselves in the midst of conditions physically adverse—though they unquestionably had the intelligence to cooperate with Earth men—well, let me suggest it this way; perhaps, having had the effrontery to transgress successfully some fundamental propriety of the Universe, it was ordained that they should destroy themselves in that accomplishment.

But their vast labor and ultimate desperate terror was in vain. They might have better met their end on Venus, dying without struggle or without vain hope.

THE END

What is Your Knowledge of Science?

Test Yourself by This Questionnaire

1. What conditions might prevent invaders from another planet from reaching ours? (Page 327).
2. Why would people from Venus have to wear protective coverings on earth? (Page 332).
3. How could the problem of city transportation be solved? (Page 321).
4. Between what temperatures does the white ant exist? (Page 296).
5. How do some kinds of termites provide food for themselves? How do they digest it? (Page 299).
6. How does the termite build his home? (Page 299).
7. In what classes do members of a termite colony fall? How are the different members developed? (Page 299).
8. What is the approximate distance between the Earth and Jupiter? (Page 349)
9. How could a floating mirror be used as a weapon of war? (Page 363).
10. What are the eight large solar planets? What is the order of their positions with regard to the sun? (Page 363).
11. What is the easiest way to travel from one planet in the solar system to another? (Page 365).
12. What possibility does each of the solar planets offer to occupation from earth men? Which has the best possibility? Why? (Page 367-8).

A Treat for Science Fiction Readers

IF you are a reader of this magazine, we naturally presume you to be a science fiction fan and if this presumption is correct, we know that, like most fans, you cannot possibly get enough of good science fiction literature. Many science fiction readers have continuously urged us to get out SCIENCE WONDER STORIES twice a month or oftener. In order to accede to their wishes we now publish a sister magazine to SCIENCE WONDER STORIES, under the name of AIR WONDER STORIES.

Do not jump to the conclusion that AIR WONDER STORIES is purely an aeronautical magazine, it is nothing of the sort. It is a science fiction magazine just as truly as is SCIENCE WONDER STORIES, containing just as many kinds of science. While it is true that in AIR WONDER STORIES we publish stories with an aviation background, yet all of the stories are *first*, science fiction and aviation second.

Practically all of the authors and many new ones we have discovered who contribute to SCIENCE WONDER STORIES are now also contributors to AIR WONDER STORIES.

And whether you are air-minded or not, you do yourself an injustice if you do not read AIR WONDER STORIES. Some of the foremost science fiction stories are found in this new magazine. Do not miss the September issue of AIR WONDER STORIES —it is so chock-full of excellent stories.

You probably know Bob Olsen, the creator of the fourth dimension stories. He has written a rattling good scientific story entitled:

"FLIGHT IN 1999"

which will be published in the September issue.

Here is one of the greatest science fiction stories of the year. Mr. Olsen, with his shrewd foresight, has given us a tremendous amount of new science of all kinds and endless possibilities, which are sure to come about during the next hundred years.

Table of Contents:

THE YELLOW AIR PERIL
By Harl Vincent
(Author of "The Menace from Below")

THE AIR TERROR
By Lowell Howard Morrow
(Author of "Islands in the Air")

THE ARK OF THE COVENANT
By Victor MacClure

WHERE GRAVITY ENDS
By Robert H. Leitfred

AVIATION NEWS OF THE MONTH

AVIATION FORUM
Technical Department for Those Interested in Aeronautics

THE READER AIRS HIS VIEWS
(Letters from Readers)

ON ALL NEWSSTANDS AUGUST 10TH

Please turn to page 380 of this issue.

Science News of the Month

ASTRONOMY—METEOROLOGY

MOVIES SHOW LUNAR "DAWN"

A moving picture film of a dawn on the moon was taken recently at the Princeton University Observatory and exhibited. The mechanism for taking the pictures was perfected by Fleming Arnett of Upper Montclair, N. J. The pictures were taken at the rate of one every six seconds, whereas the usual rate is about 16 to one second. By means of a 23-inch telescope the moon is seen as it appears 1000 miles away. At a nine-mile-an-hour rate the sunlight is seen creeping across the lunar landscape, the darkness being broken abruptly by the strong glare of the sun. There is no intervening rosy haze as on earth, neither is there a twilight after the sun has disappeared.

NEBULAR VELOCITIES PROOF OF RELATIVITY

The discovery of nebulae of stars (mentioned in these columns) found to be traveling away from the earth at the tremendous velocities of 3100 to 4900 miles per second is proof of the Einstein Theory of Relativity, according to opinions of famous astronomers in the New York *Times*. The high velocities, it is suggested, are really illusions created by the "crumpling" of space according to the Relativity theory. Light waves travelling through enormous distances of space are distorted. Further the idea that space is curved is verified by the data taken on these fast-moving stellar universes. Dr Clyde Fisher, Curator of the American Museum of Natural History, said that the validity of the Einstein theory is now generally accepted by most scientists and that the newer discoveries about the stars may lead to proof that cosmic space, long held to be illimitable, has definite limits and that light in-stead of travelling an indefinitely is hedged by this "closed universe". Dr. Harlow Shapley of the Harvard Observatory said that according to the Einstein theory very distant objects would show a "spurious velocity of recession".

MOON'S TEMPERATURE MEASURED

By the use of a tiny thermocouple two astronomers at Mt. Wilson observatory have been able to make measurements of the moon's temperature before and after an eclipse, says *Popular Science*. The instruments are so small, it is said, that if a thousand of them were placed in a balance it would only need a drop of water to equal their weight. Dr Paul Epstein of the California Institute of Technology has determined, from the experiments, that the frozen surface of the moon was once covered with fiery volcanoes. He found also that pumice of volcanic origin cooled at about the same rate in a laboratory as the moon did between exposure to the sun and an eclipse. The irregularities on the moon's surface, are believed, therefore, to be of volcanic origin.

EARTH HAS TWO LAYERS OF OZONE

Two layers of ozone in the earth's atmosphere, one due to ultra-violet light from the sun, the other due, perhaps, to particles or corpuscles shot at the earth from sun-spots, were described at the meeting of the American Geophysical Union. In telling of his studies, Dr. F. E. Fowle, of the Smithsonian Institute, said that one of these layers of ozone, which is a form of oxygen, shows an annual period of change, depending on the position of the earth in its orbit. He thinks, it is due to ultra-violet light, which varies in intensity at different times of the year. Unlike this layer, the second layer of ozone shows a close relationship to sun-spots. When the sun-spots are at their minimum number, it will probably be absent entirely, though the observations have not continued long enough to ascertain this. Dr. Fowle suggested that some emission of minute corpuscles from the sun-spots might account for this layer.

NO "RAINMAKING" POSSIBLE AS YET

The profession of "rainmaking" is that of the quack, says the Weather Bureau. No known means have been successful in producing rain over any extensive area. The reason for this, says the meteorologists, is that the lack of rain is continued by lack of moisture, and if there is no moisture there can be no rain. Those men who contract to produce rain, usually do so at a time when rain is about due anyway. Furthermore the Weather Bureau estimates, it would require 1,000,000 to 10,000,000 horsepower to evaporate the moisture of a square mile of cloud.

MARS ALONE HAS POSSIBILITY OF LIFE

Surveying the possibilities of life existing on other solar planets, Waldemar Kaempffert in the New York *Times* finds that Mars alone has the presentations necessary. He arrives at his conclusions from analyzing the conditions necessary for life and estimating what we know of each planet to the vast. The conditions he finds necessary for life as we know it are a climate between limited temperatures; an atmosphere containing oxygen (this also is dependent on the size and speed of rotation of the planet, for only under certain conditions may planets have and hold onto an atmosphere). The next condition is the mass of the planet. If it is too large the attraction of gravity is so great that the organism would have a tremendous weight and be unable to exist. The planet must contain water. The length of the days and the length of the seasons are also determining conditions if life is to exist. Only the earth and Mars have the proper conditions to support life. "But Mars," says Dr. Kaempffert, "is a worn-out shrivelled arctic world, thirsting for water." It is agreed that it has vegetation but a tough vegetation. And if any sentient beings existed—those who built the "canals"—they probably perished long ago.

AVIATION

AUXILIARY WING TO PREVENT STALLING

A new device to prevent stalling is the new Fowle Distance Cruiser T-IX, a monoplane which will be put through its tests shortly. The method of preventing stalling, very common-sense, is the use of an auxiliary wing just over the nose of the plane. There is also an additional landing-wheel under the nose which will prevent a nose-over when the plane lands. The plane has a wing spread of sixty feet, and is equipped with Wright Whirlwind motors. It is expected to make a non-stop flight to some European field this summer.

LIGHTS AND SOUNDS INDICATE ALTITUDE OF PLANES

By a recent development of Dr. E. F. W. Alexanderson of the General Electric Company, pilots can now have a positive indication of their height above the ground even though the weather may be so bad that they cannot see the ground.

The device consists of sending a radio impulse to the ground from the plane and picking up the same impulse after it is reflected from the ground back to the plane. The ground is picked up as a signal. Whenever the airplane changes altitude by half a wave-length, a whistling note goes through a complete tone cycle. By counting the cycles of the tone it is possible to measure the altitude. A meter reading from 200 to 1,000 feet gives the pilot an opportunity to know accurately his altitude within these limits. As the plane approaches the ground the echoes become stronger. A memory router is connected with the meter by which the meter continues to hold the altitude reading and give off the same echo until the altitude is changed. Connected with the device (in a manner not explained) are colored lights. A green light flashing on indicates that the pilot is 250 feet above the ground while a yellow indicates 100 feet and a red light shows an altitude of 50 feet.

OFFICIAL RECORD FOR ALTITUDE AWARDED NEUMHOFEN

Official examination of the recording instruments used in the Junkers W-33 monoplane piloted by Willi Neumhofen, indicated that he broke the world altitude record attaining a height of 41,796 feet or less than 500 feet short of eight miles.

During his trip Neumhofen passed through a temperature range of 156 degrees Fahrenheit, for it was 90 degrees above zero on the ground and 76 below when he arrived at the extreme altitude. At the top of his climb he became unconscious from cold and his machine went into a glide descending almost four miles before he became conscious again. His safety was made possible by an automobile device attached to the steering wheel. As soon as his hands were taken from the wheel (the time when he slipped into unconsciousness) an oxygen flow was released and the motor was shut off thus provoking the glide.

Neumhofen states that at almost eight miles above the ground, Leipzig and Magdeburg which are about sixty miles apart, appear as though they were only a few hundred feet away from each other.

FOOL-PROOF PLANE CONTEST NEARS CLOSE

The contest for the best fool-proof plane which the average man or woman can fly, sponsored by the Guggenheim Fund for the Promotion of Aeronautics is causing a show says Lauren D. Lyman in the New York *Times*. Very few known planes have already been entered in the contests which will award prizes of $150,000, and a great deal of mystery surrounds the actual plans of airplane makers. Believing that the average man or woman will not fly until the "fool-proof" plane has been developed (one which does not need an aeronautical expert to safely pilot) the Guggenheim Fund is making the conditions that planes must fulfill rather exacting. For example, one of the nine conditions states that "the aircraft must show its ability to take off or land on a plot 100 feet square surrounded by a twenty-five foot obstruction." Although the date set for the close of the contest is October 31, only one plane has actually submitted itself at Mitchel Field, Long Island, for the tests. This is a Brunner-Winkle Biplane built in Brooklyn, N. Y. Several other entries are definitely known.

BIOLOGY

ANIMAL EXPERIMENTATION MUST PRECEDE APPLICATION TO MAN

Because of the infrequency of reproduction in man and long periods necessary to wait before results are shown, scientists trying to determine the causes of heredity, the determination of sex, etc., have been obliged to turn to the lower forms of life, said Dr. S. F. Blakeslee of the Carnegie Institution at Cold Spring Harbor, N. Y. In this great laboratory many astounding discoveries are being made about the conditions that determine what form life is to take. The experimenters have been able, in certain instances, to bring a reversal of sex and to endow the offspring with predetermined characteristics. When enough knowledge about the determining factors are known it is hoped that they can be applied to man.

EVOLUTION CAUSES RACIAL SUBDIVISION

That the old conception of races being formed by inter-breeding of characteristics is not true is the opinion of a writer in the *Journal of the American Medical Association*. He brings to the support of his belief the work of Sir Arthur Keith and Thomas Huxley, famous scientists noted for their work on evolution. That the cast of features and pigmentation of the skin are caused independently of racial interbreeding is the conclusion arrived at. The cast of features is said to be due to gland changes and disorders that may accompany environmental changes (adaptation or survival as expressed in the evolutionary doctrine). The pigmentation is likewise a condition of environment. If the thyroid glands take on a strange activity, declared the writer, one might acquire a Mongolian cast of countenance. This might also be caused by the endocrine gland when it becomes disordered.

MOVIES SHOW BODY'S ACTIVITY

Motion pictures of the actual operation of parts of the human body were shown by Professor C. R. Turner of the Massachusetts Institute of Technology before the American Child Health Association. By means of X-rays which were photographed and made into a continuous moving film, the action of glands in the stomach by which food was digested was shown. In another film the activity connected with the swallowing of food was also portrayed. Professor Turner said he is now making pictures of the action of the kidneys, the heart, the growth of the teeth and many other physiological functions. The pictures are to be used in schools as a means of visual education of children on the nature and activity of their bodies. Professor Turner will also exhibit his pictures at the World Federation of Education Associations to be held at Geneva.

LIFE MAY BE EVALUATED MATHEMATICALLY

That life and the life processes may be evaluated and studied mathematically is the belief of Professor F. G. Donnan writing in *Nature* (London). Our bodies and most of our activity are ruled by the necessity of the conservation of energy. We are in effect cell building organisms, obeying the laws of thermodynamics. That is the part that we understand. Beyond that is the so far inexplicable phenomenon of the cell building up something which is greater than the sum of its parts. That some new form of energy that we are unaware of may be present is the conclusion. That this phenomenon can be reduced to exact measurement and its activity understood through mathematical formulas is believed to be true.

CHEMISTRY

MAGAZINE DECLARES RADIUM MONOPOLY EXISTS

That a monopoly in the sale of radium exists and fabulous profits are made on it while thousands of people are dying of cancer is the accusation of the *Industrial and Engineering Chemistry* edited by Dr. Harrison E. Howe. The monopoly, declared the magazine, is controlled in Belgium where radium costing $10,000 a gram to produce (exclusive of mining costs and overhead) is sold for $70,000 a gram retail and $50,000 to $60,000 a gram wholesale. The magazine advocates that special rates be made to research organizations who will promise not to resell the material and so depress the market. The magazine declares that the monopoly "now demands all the traffic will bear for a material which means the difference between life and death."

MAKING ICE RINKS MADE OF "HYPO" DECLARED CERTAIN

A revelation as to how moving picture studios procure their ice rinks for pictures demanding them is made by Arthur R. Maas of the Maas Chemical Laboratories in the New York *World*. Having been the source of supply for the "ice" for studios, Mr. Maas feels qualified to speak on the subject. They use, he said, a warm substance called "hypo" made from soda and sulphur. It coats on the floor half an inch thick and can be used for skating just as real ice. Further, after being used the hypo can be melted, gathered up and used over again for another rink. Mr. Maas however doubts whether it will be put into general use for that purpose. For the heat that it exudes is enervating. And, as it is well known, skaters need the tonic of the cold to stimulate them to activity.

MAKING MATCHES AND CIGARETTES FIREPROOF

The treating of cigarettes and matches, so as to make them less of a fire hazard when they are discarded, was recommended by the United States Bureau of Standards after a number of extensive tests. That the 170,000 cigarette butts and 550,000 matches that are discarded each minute in the United States are responsible for fires causing loss of many millions of dollars in damage, was the incentive for the work of the bureau. The cigarettes discarded while still glowing fall on inflammable material such as dry grass, and terrible fires are the result. The method of prevention suggested by the Bureau is the coating of the last inch or so of a cigarette with a water glass (sodium silicate) solution. By actual tests made, the Bureau believes that this will put the cigarette out and reduce fire losses from such causes by 90%. The preventative used for matches will be approximately the same, the coating of all but a half inch of the match with the water glass, so that after the match burns the half inch, it will be automatically extinguished.

PRODUCTION OF FAST COLORS

Professor Schwartz of Rensselaer Polytechnic Institute was annoyed because the athletic signs on his campus faded so quickly as to become indistinguishable. He determined therefore, to study the problem and find a way of making the colors of printing ink exposed to the sun, fast. Starting with the knowledge that fading is caused by the ultra-violet rays of light, the professor has discovered that the use of thorium, one of the earth's elemental constituents, will retard considerably the effect of the rays. Dr. Schwartz hopes that his process may be used for fabrics such as cotton and silk, as well as for printing inks.

"Science News of the Month"

portrays in plain yet concise language every important scientific advance during the month. Nowhere can the average reader get such a wealth of accurate and vital information condensed into such a small volume. Some 42 scientific journals as well as a score of other sources are utilized by our editors in the compilation of this department. The publishers welcome short contributions to these pages from the various scientific institutions, laboratories, etc.

CLEVELAND TRAGEDY EXPOSES HORROR OF FUTURE WARFARE

That the lesson of the tragedy of the Cleveland Clinic should be more far-reaching than the immediate results, was the conclusion of Elvira K. Fradkin writing in the *New York Times*. The clinic floors piled high with bodies, should serve as a warning of what to expect from modern warfare which would use gases even more destructive than the nitrogen-dioxide. For while the nitrogen-dioxide killed those immediately exposed, it lost its effectiveness in the vicinity and did not spread. But some of the gases of modern warfare, *Lewisite* and mustard gas, dropped from a fast flying airplane over a large city, would drop slowly through the city and remain potent for many days. It would fill the subways and homes as well as the office buildings with countless corpses. Recent tests have shown that planes can accomplish this, and thereby paralyze a metropolis.

CHROMIUM-PLATED CUTLERY REDUCES HOUSEWIFE'S WORK

As the inventor of a process of chromium-plating home fixtures as well as cutlery Professor Colin G. Fink of Columbia University described the advantages of his process. By electrolytically coating any metal object with chromium no drying is necessary. The object may merely be subjected to hot water to clean it and then it may be left alone. The dish towel is doomed, he says. The chromium-plated ore is about to open. Its use is being extended also to ornaments for women replacing even gold and silver. It resembles platinum and has platinum's ability to remain without being tarnished.

ALLOYS MAKE METALS USABLE

Altho pure metals are considered to be the ones that are valuable, still they are not usable in that form. Practically all pure metals, stated Sir William Bragg of the Royal Institution of London, must be mixed with other metals to form alloys before they become practically valuable. The number of ways that two metals can be put to, will vary with the proportions used, so that the uses are just as infinite as the proportions. X-Rays have shown that the atoms in a mixture form a different pattern, thereby changing the qualities of the material. In pure copper the atoms are piled together like spherical shot, each sphere touching twelve atoms. When a small amount of zinc atoms are added, they distribute themselves among the copper atoms without disarrangement. When, however, a large amount of zinc is added, a new atomic pattern is formed. It is this new pattern which gives the alloy the property of brass, which is a copper-zinc alloy.

FARM RELIEF BY BY-PRODUCT UTILIZATION

That farm relief may come from the utilization of hitherto worthless by-products of the farm rather than through Congressional measures, was the belief of chemists expressed at the Annual Exposition of Chemical Industries held in New York. Many new articles are being made from corn and cotton seeds that formerly represented a large waste to the farmer. Corn crops that went into the making of corn whiskey are now used to make lacquer. More than fifty chemical products result from the corn kernel. Among these are table oil, soap, glycerine, starch, corn syrup, etc.

Cotton seeds are now used for producing stearine, writing paper, smokeless oil, toilet ware, sausage casings and so many equally incongruous things.

Among the things also discovered was a new sugar called *Xylose* which can be made from cotton-seed hulls and is declared by government experts to have absolutely no tendency to increase the user's weight. It is about one-third as sweet as ordinary sugar.

GEOLOGY

ORIGIN OF EARTHQUAKES TO BE STUDIED

A group of scientists from the Carnegie Institution at Cold Spring Harbor, N. Y., will shortly begin a world-wide study of the origin and activity of earthquakes. The first study will be in the Lake Tanganyika region of East Africa. Other places on the itinerary include the Himalayas, Sumatra, Java, the Philippines, China and Japan. Dr. Willis who will head the expedition has had world-wide experience with earthquakes. During the severe Chile quake of 1922 at Atacama, Dr. Willis made a detailed study.

POLAR CAPS MAY FLOOD SEAPORTS, DECLARES SCIENTIST

That the presence of hundreds of miles of glaciers ice fields at the poles, particularly the South Pole constitutes a potential danger to our seaports is the belief of Alfred Rosewood, San Francisco scientist, writing in the New York *American*. Although the ice has existed at the poles for a long time the possibility of them being warmed through changes in climate or having some heated body come close to the earth, is enough to make us fearful of fifty-foot tidal waves sweeping our shores. Another of Mr. Rosewood's assumptions is that the heat of planets depends not alone on the amount received from the sun but that they have a natural heat of their own which depends on the velocity of their passage through the gravitational field of the sun. The faster the speed the more natural heat is radiated away and the lower will be a body's natural temperature.

AUTHORITIES NOW BATTLE SOIL EROSION

The problem of soil erosion is becoming such a serious one that a number of interested authorities have gone into the problem to see what can be done to check it. Seven erosion stations are to be established in that number of areas by the Department of Agriculture. The loss, yearly, due to floods, rain-wash and gullying is estimated to be $200,000,000. Field and laboratory studies will be made of the terrain where erosion occurs and the most effective methods of preserving the soil will be determined. The work of the Department of Agriculture will be handled by the Forest Service and the Bureau of Public Roads.

GEOLOGICAL SURVEY PROVIDES VARIED SERVICES

The Geological Survey of the United States now celebrating its fiftieth birthday provides services more varied than are understood by the layman says Dan Glaunon in the New York *Times*. The topographical map, which is an abstraction to the man on the street, is often a very valuable thing to a railroad planning a new line. It is the first thing a power company or city seeks for when ready to build a dam or a new reservoir. It has acted as the agent that searched out mineral deposits and led the way to the development of new lands previously uninhabited. Ascending mountain peaks and determining their height is part of the work of the intrepid men of the Survey. Our knowledge of mountain peaks has come principally from them. It is the Survey also that provides the maps which become so valuable in time of war. For on these maps which show but every house, every stream or every hill or valley, the strategy of a major engagement of war may well be fought. (The lack of knowledge of a sunken road at Waterloo was Napoleon's undoing.—*Editor*).

MEDICINE

INSANITY CAUSED BY ENVIRONMENTAL MALADJUSTMENTS

Insanity is due to a large extent to environmental maladjustments declares Professor William F. Ogburn of the University of Chicago. Certain neuroses and psychoses indicate that the individual has failed to make the necessary adjustment to his environment. The chance of a person of fifteen years being placed in a hospital for the insane is about one in twenty, the professor said. People unable to stand the confusion and disorder of the city might live happily in rural sections while others languishing in the rural quiet might be stimulated to healthful activity in the city.

FASTING CAUSES MANY DISEASES

The modern belief in fasting as a cure-all for diseases, and a means of attaining a sylph-like figure disregards dangers in the method, declares Albert Parsons Sachs, of the New York *World*. The result of studies of the population of Berlin during the war, when fasting was quite necessary, discloses outbreaks of many diseases as well as mental and nervous degeneration. Although a person can fast for a number of days and apparently have no ill-effects this does not prove that none exist. To carry on the metabolism of the body a certain number of calories are necessary to replace burnt-up tissue. A man requires generally 2,500 calories a day. If this is not forthcoming, flesh is used up to supply the necessary energy. Further a toxicosis is induced in the blood, by the change in its chemical composition when the raw materials necessary for the production of the all-necessary hormones are missing. So the woman or man who achieves graceful slenderness through fasting may find that he has induced some changes in his bodily structure that may well prove unpleasant.

EIGHT HOURS SLEEP MORE TOO MUCH

The results of recent tests of the effect of sleep on the body and brain find that eight hours sleep is some too much, says the New York *Times* editorially. From the results of tests of students at Colgate University it was found that four hours of sleep are sufficient to restore the bodily functions to normal. But for the resting of the mind, that is not sufficient. The increase in mental power after awakening seems to have increased with every hour of additional sleep. But, it was found also that the recuperative value of the sleep depended on the sleeping equipment and the other physical conditions under which the subject slept.

DIABETES DEATH RATE RISING

Because of the richness of the modern diet in food and drink the death rate of diabetes reached a new high figure declares the *Statistical Bulletin* of the Metropolitan Life Insurance Company. According to the company the death rate is kept down by the use of insulin, although the drug is no cure. Based on its experience with its 19 million policy holders, the company found the death rate to be 21.3 for each 100,000 persons.

RUBBER HEARTS POSSIBLE FOR HUMANS

In these columns the case of Dr. Gibb of Dalhousie University keeping a cat alive for a few minutes by use of a rubber heart was mentioned. Now Dr. Goldston of the New York Academy of Medicine, declares that we must not infer thereby that humans can have the same treatment. A writer in the New York *Herald-Tribune* however asks "Why not?" People have had metal replacing many parts of their body, in their skull, larynx, etc. The use of rubber hearts is not impossible, declares the writer and viewing the alarming number of deaths from cardiac troubles in children from the age of ten to fourteen, he believes that someone will suggest finally, when his heart is giving out, to allow the experiment to be done on him.

PHYSICS

ELECTRIC EYE HAS MANY USES

The uses to which the "electric eye" may be put have been described by the *Industrial Bulletin* issued by the Arthur D. Little Corporation. This little instrument which responds to the slight fluctuations in the intensity of light may control the admissions to a bridge or public hall, and count the passersby. It will detect smoke and automatically start an extinguisher; it sorts cigars according to the grade, as designated by the color of the wrapper. Used in a safe it will respond to the outstretched hand of the burglar and ring an alarm. In a store it will respond to the flashing of a policeman's searchlight and turn on the lights for his inspection. It counts the vehicles on highways and sets a window display in operation when a passerby stops in front.

SCIENTISTS SEEK NATURE OF COLD LIGHT

The discovery of what is the source of cold light as emitted by little sea animals constitutes a great problem for science, declared Dr. Charles A. Kofoid of the University of California before the Pacific section of the American Association for the Advancement of Science. The mysterious of the luminescent waters of the Pacific, and partly of the Atlantic have been attributed to the metabolic action of small fish called *dinoflagellata*. It is believed that these organisms which have spread over the Pacific in great numbers give off light as part of their process of living. Since the action is chemical, analysis of the water in which they live is expected to reveal something about them.

MEASUREMENT OF ULTRA-VIOLET RAYS NOW POSSIBLE

The intensity of ultra-violet rays can now be measured by a device demonstrated by Dr. H. C. Rentschler, Director of Research of the Westinghouse Lamp Co. The purpose of this is to prevent people who are taking ultra-violet treatments either from the sun or from a machine from receiving terrible burns. For previously, no means of measuring the intensity of ultra-violet was possible.

Uranium, which is sensitive only to ultra-violet rays, forms the basis of the device. An electrically charged uranium pole was put into a photo-electric cell. The charge generated in the cell by the ultra-violet was transmitted to a condenser and stored until a given potential was obtained. The energy was then discharged through an argon tube which gave a bluish flash. An ink pencil on a chart marked the current of the discharge. By varying the current a scale of values was obtained which acts now as an actual register or "dosage meter" which physicians can use.

PHOTO TRANSMITTED ON LIGHT BEAM

By a device recently developed by Dr. Vladimir Zworykin of the Westinghouse Electric and Manufacturing Company, a photograph or a printed message may be transmitted over a beam of light. The picture or paper containing the printed message is placed on a cylinder which rotates and moves laterally at the same time. A beam of light is projected on the paper and the reflected light gathered by a parabolic mirror which passes it through to a photoelectric cell. This creates an electric impulse corresponding to the density of the light. These impulses are then passed through a gas-glow tube which produces the carrier beam of light. This light projected across a room is caught by another parabolic reflector and passed to a photoelectric cell which again changes the impulses into electric impulses. A novel thing about this device is that the actual current is now used to reform the picture. A specially prepared paper bathed in water is on a cylinder on the receiving end, this cylinder rotating in synchronism with the transmitting. The action of the electricity on the chemicals of the paper, by electrolytic action, changes the color of the paper and recreates the original image.

RADIO-TELEVISION

INDICATOR FOR BEACON WAVES INVENTED

Engineers of the Bureau of Standards have developed a device whereby one can tell whether radio beacon waves are being maintained on their determined course. An indicator will show any deviation or shift in the waves. It will be known as a "course shift indicator." The instrument may also find use on a plane which is directing its course by the radio beacon. When the needle of the instrument remains in the center of the scale the pilot is in the middle of his course. If he deviates from it, the needle will swing to one side.

RADIO-PHONE SERVICE TO EUROPE OPENED

The opening of commercial radio-phone service to Europe was initiated recently by the placing in operation of the short wave transmission center of the Bell system at Lawrenceville, N. J. All trans-Atlantic telephone messages to Europe will, in the future, be relayed to this station and radiated from there. Three separate channels are now in use and it is expected that before the end of the year that two more, one to Europe and one to Buenos Aires will be in operation. In Europe and in South America [illegible] stations are being built. The transmitting antennas at Lawrenceville are strung on 19 150-foot steel towers placed 250 feet apart and at right angles to the [illegible] the voice waves travel.

SHIP TO SHORE RADIOPHONE SERVICE

To fill the need of persons aboard ship conversing by telephone with persons on land a series of experiments will be started by the American Telephone and Telegraph Company on a ship-to-shore service. Radiophone will connect the passenger with the company's station at Deal Beach, N. J., and from there, it is planned, the passenger can be connected with any telephone subscriber in the country.

The first tests will be conducted between the steamship *Leviathan* and the Deal Beach Station. The transmitters now used for trans-Atlantic telephony will be used in the tests.

COLOR ADDED TO TELEVISION IN DEMONSTRATION

The ability to transmit not only objects but their color by television was demonstrated recently at the Bell Laboratories of the American Telephone and Telegraph Company.

On a receiver about the size of a postage stamp were received the images successively of a red, white and blue American flag, the Union Jack, a watermelon and a pot of geraniums. The transmitter was located about 100 feet from the receiver, a wire being used for transmission in this demonstration. The invention is made possible by the use of three photo-electric cells, one being able to filter out red, one blue and the third green. (It would seem then that the device as it is now is limited to these colors.—*Editor*). The image to be portrayed is scanned by a flickering beam of light whose intensity varies and which is changed through the photo-electric cell into a fluctuating electric current. No new apparatus is needed to transmit colors as attachments to the usual televisors set will add the color.

STANDARDS BUREAU DETERMINES RADIO FADING CAUSES

Resulting from an extended series of experiments on the causes of the fading of the intensity of radio waves as received, the Bureau of Standards has arrived at seven reasons for the fading. The experiments were conducted with two stations in Maryland using various types of antennae for receiving. The variation of the intensity was studied with relation to the local conditions of the atmosphere, temperature, time of day, etc., and the following results are among those that have been obtained:

The ray undergoes variation in intensity during its course through the upper atmosphere before it gets to the antennae. In the case of nearby stations much fading is caused by interference between ground and reflected rays. Directive shifts are responsible for a certain amount of fading. Much fading is also caused by rotations of the plane of polarization of rays reflected from the upper atmosphere, during the summer period particularly.

GENERAL

MENTAL ILLS TO BE STUDIED IN GREATEST PROJECT

The greatest project ever planned into the causes of mental ills including crime, general delinquency, sleeping sickness, insanity, epilepsy and others will be started shortly by the Neurological Institute of New York. When they have reached the completion of an endowment fund of $2,000,000 the Institute will have fifty-one leaders in neurology and psychiatry attack sixty-five important problems of research into the mental ills. The environmental normal influences as well as the organic changes of the brain which take place in early life will receive a great deal of attention and the mental life of individuals will be studied in a completeness never matched before. The Institute is not waiting until its fund is gathered to fall but will start its program immediately.

249 MILES PER HOUR OBTAINED IN ROCKET SLED

In a recent test as reported by Max Valier of Germany in *Discovery* (London) a speed of 249 miles per hour was obtained in a rocket sled. A series of rockets were exploded and at the fifth series the speed was already 235 miles per hour, as an average. And inasmuch as the last seventy yards was under brake control, the higher speed was believed to have been obtained. Herr Valier, who believes that the rocket will be the future means of propulsion, is planning a rocket ship by which he hopes to make a trip from Dover to Calais this summer. The rocket, according to him, is in the same position as the airplane was in 1903.

SECRETARY DAVIS DEFENDS MACHINE AGE

Answering a recent article of Joseph Callhoun in the New York *Herald-Tribune*, on the evils of the machine age, Secretary of Labor James J. Davis defends our age though admitting its imperfections. The machine age is liberating man from physical slavery he says, and the advances in science are removing poverty from the masses. Although we suffer from a comparison with the golden age of Pericles in Greece, for we have not the great men produced then, still he says in that day the thinkers and artists were all aristocrats and the masses were held in dumb, ignorant slavery. Now we have a wide dissemination of knowledge. In fact more people can read Shakespeare today than in the days of the bard himself. The common people of today live better than kings in ages past, and for this we must thank the great number of our scientific achievements including the mass production of the necessities of life.

THE ETHER STILL EXISTS, SAYS LODGE

Sir Oliver Lodge denies that the theory of ether filling all space has been exploded. He denies also that Einstein proved that the ether does not exist. The ether must exist, declares Sir Oliver. For, without it, the heat of the sun could not travel across 92,800,000 miles to our earth, nor could the heat from our fireplace reach us a few feet away. Ether is what conducts all electric currents as well as radio waves. In the former case it is not the wire that is the conductor. The wire merely guides the current as rails guide a train. Amazing discoveries in physics that are not yet ready for popular consumption are being made at an astonishing rate, Sir Oliver also declared. They are being made so fast that each year makes those of the year before seem antiquated. The prospects for humanity are bright. Although we are barely scratching the surface of universal knowledge, we are making progress at an accelerated rate. On properly guided science the hope for the world rests.

WEAPONS OF SCIENCE WILL PREVENT FUTURE WARS

That the terrible weapons to be developed by science in the future will by their very power serve as a moral persuasion against war is the belief of T. J. C. Martyn, writing in the New York *Times*. When men realize the terrible possibilities of the weapons they are using, and have the picture of whole nations, which are economically interdependent, being wiped out they will hesitate to use these weapons.

Of all the instruments to be used in the future Mr. Martyn finds the airplane and electricity to be the most powerful. Poison gas when spread by shells is too uncertain and there is a limit to the use of high explosives, for the more powerful they become the more possibility there is of premature explosion.

Airplanes controlled by radio will spread death and destruction to whole countrysides. Then will come aerial torpedoes which will be guided by radio and detonated at exactly the right moments. Television will enable enemies to seek out the most vulnerable points of each other. And finally the use of electric power transmitted over radio beams will enable enemies to electrocute armies hundreds of miles away. "If science served only warfare," said Dr. Lewis, inventor of *Lewisite*, "it would indeed be a human curse." But the writer feels that the knowledge of this curse will be the most effective bar against war.

MANKIND THREATENED BY INSECT WORLD

If man is ever wiped off the map it will be due to the onslaught from the insect world, according to the New York State College of Forestry of Syracuse University. The great destruction of all kinds of valuable trees has shown the power of rising insect species, and new fungus diseases. Means of combatting these insects are unknown, and they are rapidly carrying on their work of destruction. Since the animals are more adaptable on earth than man, and can escape detection, they can carry on a systematic work of destroying not only his woods but also his crops and so kill off our race. What is needed, according to the college, is determined and persistent battle against the insects.

BEES NOT SO INTELLIGENT AFTER JOURNAL

Bees are not as intelligent as they are reputed to be, declares the *American Bee Journal* editorially, even though they may be possessed of other qualities humans find enviable. A recent test was conducted to determine their ability to return to their own hive when other hives were placed close to it. Bees from a certain hive were marked and then experimenters placed hives of a color similar to their own in the same neighborhood. Altogether 104 bees returned to their correct hive while 78 wandered into hives other than their own. All this happened during a quarter of an hour. In another experiment a photoelectric cell was placed at the entrance to a hive to determine the number of bees that passed in or out. The number was found to be surprisingly small.

MODERN CITY A MENACE, SAYS CRITIC

That the modern city with its tremendous overcrowding and its storing of physical and psychical explosive power is a potential menace to the inhabitants themselves is the belief of Stuart Chase as expressed before the League of Industrial Democracy. He showed a city to be resting on an ever weakening sub-structure, compressing noxious vapors, storing immense carbon dioxide, and lying exposed to attacks from the sky. "Gases and clouds from the sky, poison vapors from below and carbon dioxide between" was his description of the city. "Transportation systems, overburdened, pump us back and forth between places where we would rather not work to places where we would rather not live until a saturation point and a tragic breakdown results." The only solution Mr. Chase can see is to have the city planner in complete control.

IN this department we shall publish every month your opinions. After all, this is your magazine and it is edited for you. If we fall down on the choice of our stories, or if the editorial board slips up occasionally, it is up to you to voice your opinion. It makes no difference whether your letter is complimentary, critical, or whether it contains a good old-fashioned brickbat. All are equally welcome. All of your letters, as much as space will allow, will be published here for the benefit of all. Due to the large influx of mail, no communications to this department are answered individually unless 25c in stamps to cover time and postage is remitted.

The Jury Brings In Verdict

Editor, Science Wonder Stories:

I have read every issue of the new magazine so far published and hence am going to tell you what thoughts I have concerning it. I will put in my opinion in trial form so "lend me your ears," also your eyes.

The courtroom was crowded with science fiction fans, the jury was ready, the judge was seated and then there came a low murmur from the massed spectators. Halfway H. (Manager) Criticism was coming.

Behind him came his assistants, R. H. Brickbat, C. W. Critic and U. T. Comment, among them in formidable array.

S. W. Stories looked to his friends. He was a defendant very much worried.

"Wonder who's defending old S. W.," said one fan to another. His answer came with the appearance of Lawyer A. (Appreciative) Fanfan.

Lawyer Praises was not alone, it seemed for with him was old S. F. Reader.

The court having been called to order, the trial began. H. H. Criticism, to the delight of the audience, put S. W. Stories on the stand.

After the usual ritual, Criticism said gravely: "I have here, Mr. Stories, some complaints against you, and as district attorney I object you to tell the truth about them."

"I object," shouted Praises, suddenly, "Mr. Stories is already sworn in."

"Objection sustained," said the judge, coldly. Then to H. H., groaning to take a sip of water, "Go on."

"Number one complaint is that you express preposterous ideas. Do you?" Criticism's voice was hard.

"No. As you well know, the 'preposterous ideas' of one decade are the accepted things of the next."

"Let that go then," said the prosecutor, uncomfortably. "Next, we find it said that your science is pseudo-science."

"Well," said Stories, with a smile, "I have nearly twenty scientists of high repute on my board of science editors."

Criticism finished, "We'll pass that for now, your answer is good enough," he muttered, hastily.

"Going on to point No. 3, it is said that only half-crazy ignorant people like your ideas and read them."

"There's a real preposterous idea for you," cried S. W., indignantly. "Such people would never understand instructive stories, often written by scientists themselves."

Criticism was stumped. He turned to Praises. "Your witness," he stated. Praises looked at Stories.

"Pooeel," said he, "the defendant's stories spoke for themselves or rather Mr. Stories did."

"Another witness!" queried the judge.

"I," began Criticism, when he suddenly felt a tug at his sleeve. He looked at R. H. Brickbat, who sat at his side. "Why, yes, just one more witness."

"Mr. Brickbat will take the stand."

Brickbat went to the stand confidently.

"Well, what is your testimony?" asked Criticism.

"I read one issue of this magazine and it's wonderful," came the surprising answer. "These complaints have been proved grounded in an ultimate sense on nothing and I'm for the magazine first, last and always."

Criticism snorted and turned to Praises. "I suppose you've no questions?" he groaned.

"No, I haven't."

"Then the state rests."

The jury was not out long.

"What is the verdict?" asked the judge.

"Guilty!"

"Of what?"

"Of being the best magazine on the market!!!"

Then presently Praises turns to the judge:

"And the sentence?"

"Is a long one. I hereby sentence Science Wonder Stories to keep going and growing forever!"

Wild applause and court is adjourned.

Frank Kelly,
Kansas City, Mo.

(We found Mr. Kelly's description of the trial of SCIENCE WONDER STORIES intensely interesting as well as containing a great deal of subtle truth. Anyway we are happy to receive the verdict and assure our readers that "old S.W." has already begun serving his sentence.—*Editor*).

Why Is There Heat and Light Through a Vacuum

Editor, Science Wonder Stories:

In the July and August 1929 editions of this singular magazine, I have been especially attracted by the educational topics entitled, "The Problems of Space Flying," by Captain Hermann Noordung of Berlin, and your editorial entitled "The Wonders of Space."

After having read these articles, I was left in a deep abyss of doubt, as to the probability of such an enterprise as space flying.

I am not a skeptic. I am merely making an attempt, perhaps a futile attempt, to co-ordinate logic with guesses.

Before allowing the profound thinker to begin thinking as to whether space or matter was in existence first, don't you believe it would be better to have them solve the relationship of what space really consists? Because how could they attempt to solve that age-old question before they knew what space is, or what it consists of?

They contradict their own statements, theories, and hypothesis so often, that it makes one's head dizzy. For instance, they say that space is a vacuum. Have they any concrete proof of it; so that they could without a doubt prove it to be so?

Did they at any time really attempt to prove it? Then they go on to say that light and heat are vibratory motions, that on earth these proven facts are transmitted through an unknown phenomena, an unknown medium filling all space. But in space which is a vacuum and is therefore devoid of any such transmitting medium, because a vacuum is an absolutely empty space, how then is it possible for the heat and light waves to reach the earth from the sun, moon and stars, or even to be transmitted for such a short distance in space as one million (1,000,000) miles?

I therefore believe that if these same thinkers would solve the mystery of space existing at the present time, they should then have a concrete basis to start working on the problem as to whether space or matter was the first to exist.

I am in favor, and I believe it would be a godsend to the layman for you to publish more such educational articles as "The Problems of Space Flying." The other stories are merely good to instruct and forewarn the public of future possibilities. I am and was an ardent reader of your publications and editorials, Mr. Gernsback, even though this is the first time I take the liberty to praise or criticize. I am a college student, and am not ashamed to show your publications around.

Hymund D. Kahler,
Bronx, N. Y.

(When Mr. Kahler asks how it is possible for heat and light to reach us through the vacuum of outer space he poses a question to which science has as yet found no answer. That is to say it has found no medium through which heat, light and even radio waves travel when they pass through a vacuum. It was thought that some all pervading *ether* was the vehicle that carried the vibrations. The ether theory however has received a severe jolt at the hands of Einstein. The latest belief of Eddington is that there is no total vacuum in outer space but a very, very thin dissemination of some material. That this material acts as a carrier is to be doubted.

We might say, however that there is no necessity of an actual carrier medium for light and heat waves. The mystery of their transmission through empty space merely dulls our imagination. We profess not to be able to conceive of their passing through a vacuum.

The proof of the vacuum of outer space has been obtained by spectroscopic means. Of course no one has ever been there to test it, but our astronomical instruments can do that job just as well. We do not know that an absolute vacuum exists but we know that it is pretty close to one.

We agree that one must not lose his mental balance because one scientist makes a so-called "discovery." Each person must weight the logic and reasonableness of it before accepting it.—*Editor*).

Does Not Favor Forum

Editor, Science Wonder Stories:

The cover illustration of the August issue is the best of the three issues so far published. Paul certainly is doing his duty.

I am sorry to hear of the death of Garret P. Serviss. I also read of it in a Chicago paper that his articles were published in. Why not print some of his stories in SCIENCE WONDER STORIES?

I picked out "The Alien Intelligence," by Jack Williamson as the best story in the August number. "The Radium Pool," by Ed Earl Repp following a close second and "The Feminine Metamorphosis," by D. H. Keller, M.D., third.

I am NOT in favor of the proposed new department on scientific technical questions and answers. You are taking enough room with "Science News of the Month." Neither the latter department nor the proposed one should be in a science fiction magazine. The latest science news can be obtained in any of the many science news magazines on the newsstands. What you publish is not the latest news. So much for "brick-bats."

I received and read the first six of the science fiction series. All of them were very good. About how often are you going to put out these books? I liked the paper used in the books and I think it would be a good kind to use in SCIENCE WONDER STORIES, only it should be a little thinner, so as not to make the magazine as bulky as it is now.

I have nothing to complain against the stories, as they all have been very good.

Jack Darrow,
Chicago, Ill.

(We are very glad to get Mr. Darrow's views on the proposed department for the answering of questions on science. The asking for a vote on the question indicates our desire to know what our readers want. We invite our readers to not only send in their votes but to express their views freely through these columns. For it is only by your expressions of opinion that we really know what to give you.—*Editor*).

A Thorough Classification

Editor, Science Wonder Stories:

Am writing primarily to let you know I've received the first three issues of your glorious magazine, and eagerly await the fourth. However, as a secondary matter, I'll give you my opinion of your stories.

Every story I read I put into one of three classes.

A—Very good. A story I'd recommend to a person I'd like to enlist in the ranks of the readers of SCIENCE WONDER STORIES. A story with charm, imaginative appeal, etc; a story I like to reread.

B—A story which is good as long as it lasts, but which I do not care to reread.

C—A rare type of [illegible], indeed, in our magazine. A story in the place of which I'd rather see another. An inferior type.

Well, here goes!

A

"Warriors of Space," James F. Marshall
"The Alien Intelligence," Jack Williamson.
"The Moon Beasts," William P. Locke.
"The Bensalem Horror," David H. Keller, M.D.

B

"The Reign of the Ray," Lester and Pratt.
"The Marble Virgin," Kennie McDowd.
"The Threat of the Robot," David H. Keller, M.D.
"The Making of Misty Isle," S. A. Coblentz.
"The Menace from Below," Karl Vincent.
"The Eternal Man," D. D. Sharp.
"The Feminine Metamorphosis," D. H. Keller, M. D.
"The Radium Pool," (so far) Ed Earl Repp.
"The Diamond Maker," H. G. Wells.

There are none for "C" so far but the Diamond Maker could never being a total loss.

"The Problems of Space Flying" cannot so far as I can see, be contradicted or criticised in any way.

"Science News of the Month" is a huge success with me.

I see, in "General Science News," that Garrett P. Serviss has died. I am sure you would be doing many others besides myself a favor by reprinting in forthcoming issues of our "mag," his five great stories: "The Moon Maid," "The Deluge," "The Moon Metal," "The Conquest of Mars," and "A Columbus of Space."

Or how would this do? Put each of the five stories in a Science Fiction Series book.

Theodore Engel,
New York City.

(This is the most carefully thought out classification of stories that we have received thus far. We rather like the divisions into which Mr. Engel has placed the stories. We are sure that our authors will be very much interested to see where their stories are placed.

In case other of our readers disagree with Mr. Engel's classification of any story we invite them to send us their own lists. It would be very interesting to compare them.

So far "Warriors of Space" has been acclaimed an almost universal favorite despite the criticism that has been levelled against some of its science.—*Editor*).

Mr. Pratt Reviews "Warriors of Space"

Editor, Science Wonder Stories:

I don't know how far it is proper for one writer to criticise another; but there is a scientific mistake in Mr. Marshall's story, "Warriors of Space" in the *June* issue that seems to be worthy of some comment.

Mr. Marshall terminates his story by having the space cars tow Saturn and his moons down and fling them into the sun. Now in the first place, the body of Saturn's dimensions passing through the solar system as close to the other planets as it would have to on its way to the sun would be extremely likely to upset the whole system; just in what direction is largely a matter of guesswork, as it involves "the problem of three bodies." But it is certain that conditions on the earth would never be the same again; nor on any of the other planets.

However, this is not all. If a body of even asteroidal dimensions were to collide with the sun, it would strike the surface with a high velocity and penetrate quite deeply through the ravelled exterior before stopping. Its kinetic energy would be changed to heat energy and would form a center of heat greater than anything found outside the blue-white stars; far greater than the heat of the surrounding solar layers, as can be shown quite easily by calculation.

This heat is sufficient to build itself up by bringing about further releases of energy from solar sources, making the center of heat around the planet still hotter, and as the sun acts as a perfect gas, this intensely heated "pocket" would explode. It is possible to show that it would blow the upper layers of the sun clean away from it with a force so great that its gravitational attraction could not hold them.

The sun would thus become a "Nova," and be surrounded by a layer of rapidly expanding gas rushing outward at speeds of the order of 1700 km. per second, or enough to reach the earth in a little less than the day. Now this flaming gas, reaching the earth a day afterward would burn the whole business to a cinder in no time at all.

A body of Saturn's size, flung into the sun would, in fact, [illegible] enough to [illegible] sun [illegible] most brilliant nova in the heavens; and [illegible] could continue to exist on earth for just about 23 hours after Saturn struck the sun.

My authorities are Seeliger, Pickering and Russell.

Fletcher Pratt,
Brooklyn, N. Y.

(In order to completely answer Mr. Pratt's criticism of Marshall's "Warriors of Space," we sent his letter to Professor Samuel G. Barton of the Flower Observatory, University of Pennsylvania. Professor Barton is one of the distinguished members of our board of Associate Editors. We print herewith without comment Professor Barton's letter.—*Editor*).

The annihilation of Saturn and its satellites would cause but a very slight disturbance in the solar system. The magnitude of the disturbance which would be caused by pulling Saturn through the system would depend upon how closely Saturn approached the other planets in its passage and upon the length of time it remained in their vicinity. The disturbance to the earth would be very considerable if it approached closely enough to produce the tidal effects described. In the story the mass of Saturn was merged with that of the Sun. The effect of adding this mass to the Sun would be to decrease the mean distance of the earth from the Sun by the comparatively small amount of 26,500 miles and to decrease the length of the year by about five hours. Saturn might easily pass through the system and have but [illegible] greater effect than this upon the earth. The disturbance possible would range between this and that caused by an actual collision.

The effects of the fall into the Sun are substantially as described in the second part of Mr Pratt's letter. However, as Saturn was drawn in, it would greatly increase the speed of its revolution about the Sun and would not strike its surface perpendicularly.

I may state that the attractive force of the Sun upon Saturn is equal to the weight of 44,000,000,000,000,000 tons. This enormous force would cause Saturn to move only 0.00129 inches in the first second. If Saturn were pulled straight into the Sun by the Sun's gravitational pull, in other words if it fell into the Sun, 5.2 years would be consumed in the fall. But the pull of the Sun varies inversely with the square of the distance and thus increases at a great rate with the approach of the Sun. This gives some idea of the power ascribed to the space cars which pulled Saturn into the Sun in minus five days if I read aright, for in chapter nine we are told that over 39 days elapsed from the departure of the space cars from the earth before Donald gave the command "pull," and in the tenth chapter we are told that on the thirtieth day from the departure Lenina noticed the startling events caused by [illegible] wonderful pull. The professor must [illegible] a bit excited when he stated that the [illegible] Saturn takes three days to reach us. I [illegible] that the warriors of space from the ninth [illegible] Rite of Saturn, which apparently was left behind, will sooner or later wreak their vengeance on the earth. The [illegible] of Saturn I [illegible] were placed by Donald on the fingers of Lenina.

Samuel G. Barton.

Once Called Science Fiction "Brainstorms"

Editor, Science Wonder Stories:

"What Science Fiction Means to Me," I glanced at that headline with interest and read the data beneath. Then I thought, just what does it mean? All I can say now is that I have a great deal of respect for the author of

(*Continued on page 376*)

NEXT MONTH

Science Questions and Answers

LAST month we asked our readers to vote on the "SCIENCE QUESTIONS AND ANSWERS DEPARTMENT." We received a great many letters from our readers who asked us to enlarge the scope of the magazine by printing answers to scientific questions that they might ask of interest, not only to them, but to all readers. We put the question to a vote and attached a voting coupon which was to be filled out by the readers themselves.

As we go to press, we are in receipt of thousands of coupons; fully 99% of the votes tabulated show the unmistakable trend of our readers' wishes; and that is, they vote overwhelmingly for a new department.

Accordingly, SCIENCE QUESTIONS AND ANSWERS starts in the October issue.

In this department we aim to answer scientific questions which our readers may ask, and we will publish those questions and answers which we feel are of interest to the *majority*.

If anything puzzles you in any of the various branches of science, such as Astronomy, Biology, Radio, Chemistry, Medicine, Physics, Electricity, or any general scientific topic, write to us; but please do not ask more than three questions at a time.

This new department does not answer individual questions by mail, and of course, it will be impossible to publish ALL questions. The editors will try to answer as many each month as space permits. There is, of course, no charge for this service.

Address all questions to the Editor.

The Life of the White Ant

By MAURICE MAETERLINCK

The Celebrated Poet and Author

The Termites—the white ants—are small insects living in underground colonies without ever coming into the air. Their subterranean homes are marvellously built (with provisions for ventilation, central heating system, etc.) and are topped by a cupola, sometimes twelve feet in height. Millions of blind termites live within the nest, divided into castes. Whenever the workers leave the termitaria, they use tunnels, working their way into trees, furniture and walls of houses, which they devour silently and invisibly, with fearful destruction. All termites are subject to an iron discipline, a terrible tyranny which Maeterlinck compares to Bolshevism in its extreme.

Maeterlinck does not hesitate to declare that from many points of view the civilization of the termites, grim and repellant though it be, is ahead of our human civilization—that these insects possess a more scientific genius than is found in men. As in "The Life of the Bee," the author has drawn from the story of the white ant a profound and moving philosophy of human life and its ultimate development and goal.

Dr David H. Keller's story: "The Human Termites" is based upon this book of Maeterlinck, and anybody wanting to have a better knowledge about Termites should by all means read it.

PRICE $2.50

Add 10c for Postage

STELLAR PUBLISHING CORP.

90 Park Place, New York

The Reader Speaks

(Continued from page 371)

that simple sounding title. If I were the master of a dozen languages I might possibly enlist a dazzling array of bewildering adjectives that would exactly express my feeling toward *Scientific Fiction*.

The first thing scientific fiction ever meant to me was recreation. I used to peruse on every periodical with the idea of seeing my favorite author's latest "brainstorm," yes, I called them brainstorms. Now, however, Science with me has become a hobby, a recreation and a source of educational experience. I have perused textbooks, laboratory manuals and treatises on science of all imaginable sorts. And then I chanced upon my first issue of Mr. Gernsback's original gift to the world of scientific literature. Today Scientific Fiction to me means the easiest route to a complete knowledge of the relationship of physical and material facts to myself and this planet we live on. This last statement I feel brings my ideas and the printed word into the closest conceivable affinity.

I thank Mr. Gernsback again for his sound original and startling tribute to modern literature.

C. W. Cooke,
Frankfort, North Dakota.

(We were very glad to get Mr Cooke's sincere and understanding view of the value of science fiction. The evolution he says he passed through is quite characteristic of that of most intelligent people. We think it quite natural that at first they view science fiction as something absurd, extravagant and fantastic. We are quite willing that it be so. For science fiction comes to them as such a new and startling experience that viewing it from the standards of the cold, realistic fiction they know, they are unable to swallow it. But it is only after they have become acclimated to the thrilling adventures of science fiction and are able to mentally bridge the gap between those adventures and the world of the future, that they can write letters such as this one of Mr. Cooke.—*Editor*).

From Hart Vincent

Having just finished reading the July issue of Science Wonder Stories from cover to cover, I feel that I must write to you to express my pleasure and appreciation of its general excellence. It can not fall to succeed after the flying start of the first two issues.

I am especially pleased with the make-up of my own story as printed. The titling and sub-titling of the chapters was done to perfection and improved the story considerably.

The concluding instalment of "THE REIGN OF THE RAY" is great.

Hart Vincent,
New York City.

(We print without comment this letter from Mr. Vincent, one of our finest authors.—*Editor*).

On Lifting the Leviathan

Editor, Science Wonder Stories:

I have received the first two issues of your new magazine and desire to congratulate you both as regards the contents and appearance of the publication. The stories which seem to me to be best are: "The Alien Intelligence," "The Reign of the Ray," and the "Dendaus Horror." These three stories seem to be distinctly outstanding, the last especially is of a quite unusual type. The first shows a distinctly skillful and alluring use of imagination and is, in my opinion, the best of the three.

I was much interested in your leading article on gravitation, but have you considered the fact that whilst the weight of a body varies from planet to planet the *mass* or inertia is the same on earth or in empty space? In other words to raise a body weighing 200 lbs., we must exert a greater force than 200 lbs. weight, the magnitude of this extra force depending upon the rate at which it is raised. If we suppose that the man on our imaginary small planet were exerting a maximum force of 215 lbs., we obtain the following rather interesting results:

The ship to be raised to a height of 6 feet would require 25 minutes, which would impose rather a strain upon the physique of our strong man. Further, if he were released the ship, it would still continue to rise another 11 inches, and would then gradually fall back to the ground reaching it in 39 seconds. The above results can be obtained by simple arithmetic from the two well known laws of kinetics that

1—Impulse varies as momentum and

2—Space passed over in the product of velocity by time.

These aspects of the question, as indeed the whole discussion, although purely theoretical, are nevertheless very interesting to work out to their logical conclusions.

I approve very much of the good stout paper on which your stories are printed.

J. S. Bois,
Brussels, Belgium.

(Mr. Bois's analysis of the problem of lifting the *Leviathan* out in comparatively free space is indeed very interesting. From a mathematical point of view his conclusions are undoubtedly correct. That it would be quite a strain on the strong man we grant. But we believe that for the privilege *of being able with his physical strength alone to lift what on earth is 59,000 tons* one must be quite willing to risk the strain. We must look on the feat as quite phenomenal under any conditions. However, we are very glad to get Mr. Bois's analysis.—*Editor*).

Describes Science Correspondence Club

Editor, Science Wonder Stories:

I have been wanting to write to you ever since the inception of your magazine, but I have been so occupied that I was unable to communicate with you until this time.

As you will notice by the letter head, I also am a member of the Science Correspondence Club, introduced to the public last issue through my fellow member, A. B. Maloire. I might add this to his reference. The club's aim is to bring together those who wish to compare their pet ideas and theories with others scientifically inclined, and to hold debates on the same by mail. Thus, a correspondence can be kept up indefinitely. The need for such a club was often expressed in the columns of your former organ of science fiction, but it seems to have been put off until recently.

Now I feel inclined to usually toss a few more brickbats at the battle-scarred veteran authors who have earned it by inserting glaring scientific fallacies in their stories.

1. "Warriors of Space"—The men of Dione had a disintegrator ray that destroyed everything but gold. Therefore, as they had none of that element, which would be needed to reflect the ray, their own apparatus would be destroyed, and the Dionians would be as utterly annihilated as the Tellurians, if the ray had time to generate itself.

2. "The Marble Virgin"—I advance the same arguments as the other criticisers of the story. Moreover, the statue was marble all the way through, while the human body consists of different organs with variations in the form of protoplasm. Again, I hold it inconceivable that a consciousness can be endowed as the result of physiochemical reactions. This has never been proved to the contrary, and never will be.

Leonard May,
Jersey City, N. J.

(We were particularly happy to get Mr. May's letter as we are very much interested in the activities of the Science Correspondence Club. That there exists a place for such a club composed of people interested in the future of science and in discussing general scientific questions, there remains no doubt. We are happy to extend any support possible to make the club a success.—*Editor*).

Universe Large Enough for Him

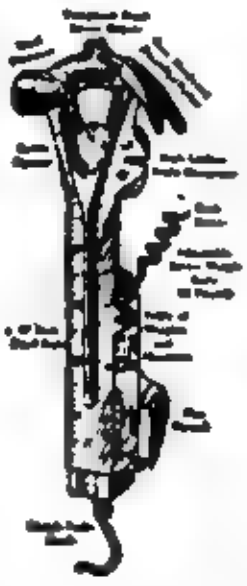
Editor, Science Wonder Stories:

In the July issue of Science Wonder Stories under "Science News of the Month," I saw the statement that the radius of our universe is 32,500,000,000,000,000,000,000 miles. This estimate, although somewhat conservative, substantiates Einstein's theory of a finite universe. Before I saw this article I had calculated the radius of the universe to be 244,-500,000,000,000,000,000,000 miles by a little algebra and less astronomy on the basis of Einstein's theory that the 96th circle is the limit of the universe. (The 96th circle is a series of circles in geometrical progression beginning with a radius of 1 cm. and being doubled each time).

Although I am but a junior in high school, I love to calculate and cogitate on problems and theories. Not stopping at the radius of the universe I set about to calculate the volume of it. Knowing that the number of cubic

(Continued on page 377)

Ten Tools In One



A small but handy article which serves for every possible need of the all-round mechanic. Invaluable in any emergency.

An excellent combination of utilities for the household—every necessity featured: hammer, knife - sharpener, nail-puller, bottle - opener, screw-driver, can - opener, corkscrew and weight-scale. Just glance at the illustration and you will see how really useful this article is. Only 10 in. high. Indispensable to motorists, Campers, Boy Scouts, carpenters, plumbers, etc.

Price $1.50 Postage Paid

Be the first one in your town to own the "Ten Tools in One." Send in your name, address, city and state with one dollar.

GRENPARK TOOL CO.
245 Greenwich St.
New York, N. Y.

DO NOT READ THIS AD

If You Do Not Own a Radio Set, But Everybody Interested in Radio Should Have a Radio Encyclopedia

S. GERNSBACK'S RADIO ENCYCLOPEDIA is the only standard work ever published in America attempting to classify alphabetically the countless words used in the highly specialized science of RADIO. The ENCYCLOPEDIA is written in plain English so that everybody can understand the definitions and descriptions.

The work contains 1,930 definitions, 549 photographs, drawings and diagrams.

REMEMBER THIS IS A REAL ENCYCLOPEDIA—NOT A DICTIONARY—and very few of the things described and illustrated in this volume can be found in any dictionary, or any other encyclopedia.

Edited by SIDNEY GERNSBACK, Author of "Wireless Course in Twenty Lessons"—"One Thousand and One Formulas" — "Practical Electricity Course"—"The Radio Educator," etc.

Former Price $2.00
Now for a Limited Time
$1.49

ISKOR PRESS, Inc.
286 Fifth Ave., New York

ISKOR PRESS, Inc.,
286 Fifth Avenue, New York, Dept. S-S.

Send me one copy of Sidney Gernsback's First Radio Encyclopedia in one volume as advertised. I will pay postman $1.49 plus postage on delivery.

Name .....

Address .....

Town and State .....

The Reader Speaks

(Continued from page 376)

miles in the universe would be too large a figure to put down on paper I computed the volume in cubic light years.

With the following information gleaned from an almanac.

Length of a year—365 days, 6 hours, 9 minutes and 4.6 seconds.

Speed of light—186,324 miles per second. I calculated the number of seconds in a year to be 31,472,942,815. Then with the speed of light and the number of seconds in a year I found a light year to be 7,543,487,385,452.06 miles. But round numbers are better suited to compute such inconceivable quantities as cubic light years. Assuming that the universe is a sphere with the aforementioned radius, I found that its cubic content is

248,384,396,826,660,000,000,000,000,000,000,000,000,000,000,000,000 cubic miles or 1,943,764,460,000,000,000,000,000 cubic light years. Yes sir, that little old universe is large enough for me.

Wishing you success in your new publication, I am

Earl Valet,
Brooklyn, N. Y.

(The universe is indeed large enough according to Mr. Valet's calculations to afford us breathing space. We must be impressed with our own insignificance in realizing that even traveling with the speed of light it would take us hundreds of millions of years to reach the outermost limits of the universe. In fact there are stars in existence that we will never see because their first rays of light after they came into existence hundreds of millions of years ago, are still traveling toward us through space and have not yet reached us—Editor).

Why Is Uranus Neglected?

Editor, Science Wonder Stories.

I'm writing this little epistle to air my views on "Our" new magazine. The very first issue sure dished with me. The second was even better; all the stories were excellent and the best were essentially good. The best story in the first issue was, according to my way of thinking, Jack Marshall's superb "Warriors of Space." The sheer daring it almost took my breath away. Running a close second was Kennie McDowd's story, "The Marble Virgin." It is hard to choose between these excellent stories as to which is best. "The Reign of the Rag" failed to go over with me for some reason or other. Just didn't hold my interest.

As I have remarked above, the second issue was by far the best.

The paper was fair and every bit a better class and didn't resemble a "Western" magazine paper in touch. The size of the magazine looms big in my eyes, for it makes a more looking magazine; the new cover seems to give it distinction. Must but Artist Paul is sure putting out the "goods" for "our" infant magazine.

The story that took the palm in the second issue was Jack Williamson's "The Alien Intelligence." Talk about a story! I also greatly admired Hart Vincent's "The Menace from Below."

Why is it that our writers never touch upon the planet Uranus? I don't remember having read a story that even mentioned the planet.

Is there no possibility of its being inhabited? Why can't we have some stories by Edwin K. Sloat? His "Flight to Venus" was a sort of masterpiece in science fiction. A sequel to this story would go well with me. I like especially stories of the moon. The best story I have read on this subject was "The Death of the Moon."

We ought to have more stories like "Moonfall," "To the Moon by Proxy" and "Reprisal." These stories were models of what a short but interesting science fiction story ought to be. Just a few words more and I will close.

I see nothing but a rosy and successful future for Science Wonder Stories for there is no getting around the fact that they are interesting and instructive and what I say this I know what I am talking about for I have read all my life. In fact that is all I do. So just keep Hart Vincent, Jack Williamson, Kennie McDowd and Jack Marshall at work, not to mention Paul and my will in the best and don't worry about the future.

Harold Hood,
Greenville, S. C.

(Continued on page 378)

SOLVED at Last!

What to do with Old Razor Blades!

DON'T throw them away! For old razor blades are worth real money—now that KRISP KROMP invention does an amazing war—and gives them the kind of edge you have only dreamed about until now. And not only that. It can take a new blade right out of a fresh package and increase its sharpness almost 100%!

KRISP KROMP makes blades last unbelievably long. Ten weeks of daily shaves from a single blade is only a low average—while any number of users use it record where one blade has lasted for 200 days, and shaves a year!

SPECIAL OFFER NOW! KRISP-KROMP fits all blades never Dull—and to make it easy to test it, we are announcing a special limited offer. Right now we are including FREE a new kind of razor never sold in stores. Actual three ways and in shockingly sudden appearance before. Find out about it today. No obligation. Clip coupon below for offer. Mail it now!

KRISP-KROMP CORP.
Dept. S-SSS. 1410 Pendleton Ave., St. Louis, Mo.

Krisp-Kromp Corp., Dept. S-SSS,
1410 Pendleton Ave., St. Louis, Mo.
Without obligation please send me your special offer on KRISP-KROMP and 3-way razor which is being included free.
Name .....
Address .....
Town ..... State .....
[ ] Check here if interested in becoming representative

AGENTS

Find out how to make $100 a week and more introducing KRISP-KROMP to men in your locality. Full or spare time. R. H. Hopkins (Mich.) made $30 first day. We show you how. Check brands of coupon for details and attractive proposition. Mail it now.

BROWNIE NAME CARDS

Latest Handy Size. 50 Perfect Name Cards and Case Only

Size 1¾ x 2¾. Choice of Old English, Plain, or Script Type. Address ..... Telephone ..... In Every With Handy case and Fancy box. Send Stamps, P.O., or Money Order. Satisfaction Guaranteed or Money Refunded. Print copy ...

BROWNIE NAME CARD CO.
45 Elm Street Waverly, N. Y.

CORRECT YOUR NOSE

10 DAY TRIAL OFFER

Obtain a perfect-looking nose quickly at home, while you sleep. GUARANTEED!

FREE BOOKLET

48,000 Others quote praise daily. Many Actresses. Gold Medal Winner. Write today.

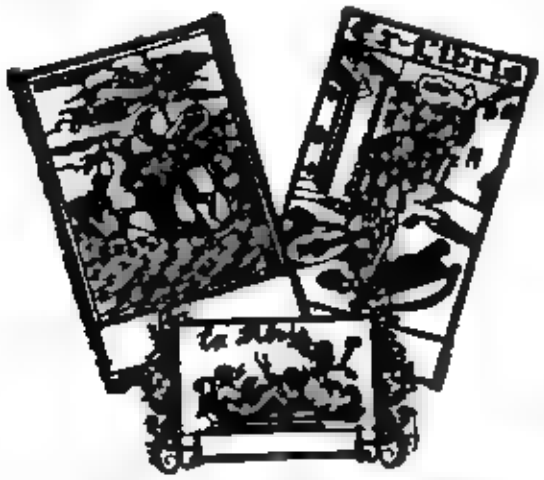
Anita Institute, E-67 Anita Bldg., Newark, N. J.

WORKS LIKE MAGIC

At last! An automatic simple little can opening machine for the home! This revolutionary invention is only a few short months but hundreds of old can openers from over 100,000 kitchens. And no wonder! Imagine an amazing, lifelong device that holds the can and cuts out the top leaving can rim slick, smooth and clean. Just turn a crank that's all. Approved by Good Housekeeping Inst., Modern Priscilla, etc. Write today for special introductory advertising offer.

AGENTS
Men and Women make $5 to $15 an hour. Full or spare time. Big, worthwhile commissions on every sale. Exclusive territories. Write for FREE OUTFIT AND SALES PLAN. Don't delay. Write today.

CENTRAL STATES MFG. CO.
Dept. S-307 4500 Lindell Blvd. St. Louis, Mo.

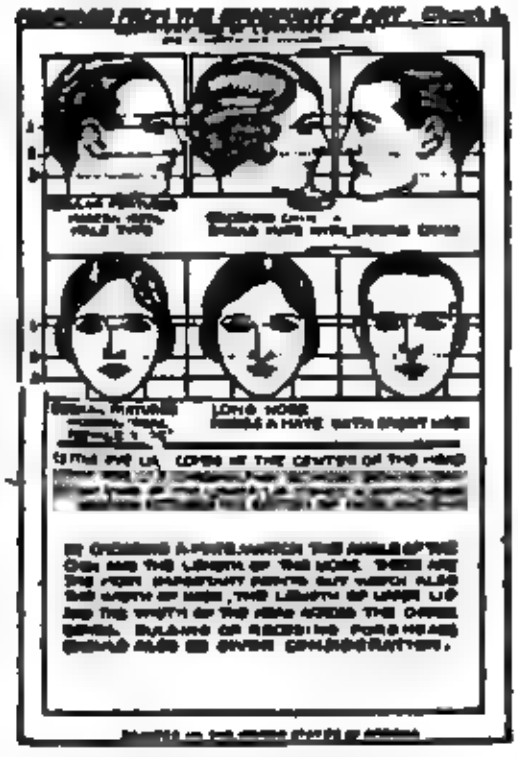


Ex Libris--Beautiful Bookplates

DO YOU TAKE PRIDE IN YOUR LIBRARY? A personal bookplate, with your name on it, insures you against loss of your cherished volumes. The friend who borrows your book can't fail to be reminded that *it belongs to you!* A bit of the feeling of the great Old Masters is captured for you in our artistic *Duo-Tone Bookplates*, reproducing old woodcuts and engravings, on antique-tint vellum paper. $2 up per hundred, your name imprinted. Send 10c for specimen and Illustrated catalogue of our unique new series.

ISKOR PRESS, INC.
286 Fifth Ave., (9th floor) New York

Don't get married, don't even become engaged until you read



The above illustration is reduced in size from the booklet "Marriage from the Standpoint of Art," sent postpaid for 25 cents, stamps or coin, by C. Arthur Taylor, 202 W. North Avenue, Chicago, Ill.

X-RAY KATHOSCOPE

Everybody wants it.

See your best girl and all she's doing. No one knows; but you see everything. Periscope operates in all climates; lasts lifetime, ready for use. $1.00 cash with order for this wonderful instrument and 8 astonishing French pictures. KATHOS CO., P. O. Box 230 City Hall Post Office, Dept. WS, New York City

SONGWRITERS!!!

Substantial Advance Royalties are paid on publisher's agreement. Write for Free Booklet on developing ideas for song words or music required by Talking Pictures. SUPERIOR ASSOCIATES, 1674 Broadway, New York

The Reader Speaks

(*Continued from page 377*)

(It is very interesting to get Mr. Hood's analysis of the first two issues of SCIENCE WONDER STORIES. We are glad to note also that he liked the second issue better than the first.

The majority of comments we received about the June issue were on the stories that Mr Hood picked as the best: "The Marble Virgin" and "Warriors of Space." Our personal belief is that despite the criticism against its scientific faults, "The Marble Virgin" has an excellent construction and plot. In many ways it embodied characteristics of the model science fiction story. Kennie McDowd has promised us a sequel to it.

Mr. Hood's question about Uranus is certainly well taken. Uranus is one of the planets about which we know little. It is next to Neptune, the most distant planet in the solar system, and is supposed to have a climate exceedingly cold. It has further, no atmosphere and the chances of its being inhabited are quite remote. However, some day an enterprising science-fictionist will study the planet and evolve a surprising story about Uranus. We are contemplating for a future quarterly a story about the moon that will make history.—*Editor*)

Religion and Science Compatible

Editor, Science Wonder Stories:

I have just been reading "What Science Fiction Means to Me" and "The Reader Speaks" in the July issue of SCIENCE WONDER STORIES. I was surprised at the fact that all the letters in both departments came from the "antipodes" of our country. California and New York are unusually well represented, while from the middle west there is not one single chirp! Is the spirit of scientific adventure in this part of the world so dead as all that?

SCIENCE WONDER STORIES is living up to the promises you made in your letter to its charter subscribers. "The Alien Intelligence" is very good. There comes up that comparison with "The Moon Pool" again. I am one of the unfortunates who missed "The Moon Pool," and I would appreciate information as to where a copy of it can be obtained. "The Reign of the Ray" is too complicated in plot and contains too much matter irrelevant to the scientific part. (However, "what's one man's meat is another man's poison.") The possibility of an immense bubble under the earth's crust, inhabited or not, is captivating and altogether possible—much more so than the brain surgery contained in "The Menace from Below." "The Problems of Space Flying" brings out a lot of obvious points apparently overlooked by space fiction writers. However, such detail properly belongs in an article, not in fiction.

Keep on telling us just a little about the stories for next month. It whets our appetite for the feast in store for us.

I think the subject of the relationship of the structure of the atom to that of the universe, and the possibility of our universe being composed of atoms of matter in a super-universe where a second of time is an atom to us, is especially interesting and plausible. It also has great possibilities as a scientific interpretation of that future abode where "time shall be no more." The Fundamentals of Religion are becoming more and more compatible with science as research goes on. The man who says that scientific study made him an infidel is either an infidel from the start or is singularly unobservant. It is not too far-fetched to believe that even the miracles recorded in the bible were the workings of natural laws with which we are not yet acquainted.

I impatiently await the arrival of the first quarterly.

L. E. Foltz,
Indianapolis, Indiana.

(We agree with Mr. Foltz in that we see no incompatibility between scientific knowledge and true religion. By *true religion* we mean that feeling of seeing a plan in the universe and drawing a lesson or a philosophical conclusion regarding our place in it and our mode of conduct. The great men of religious thought and teaching and the great men of science have always understood one another. Therefore the world of Einstein and the world of a great religious leader (unbiased and not prejudiced by dogma and cant) should be one.

(*Continued on page 379*)

AGENTS WANTED

GOLD LEAP WINDOW LETTERS and Script Signs. No experience; 500% profit. Samples free. CONSOLIDATED, 69-AX West Van Buren, Chicago.

FREE BOOK. Start little mail order business. Hadwil, 27A-74 Cortlandt Street, New York.

REPRODUCE SIGNS, Pictures, Typewriting without type or press. Simple, Inexpensive. Samples and particulars, 10c. Straley, 1134 W. Main, Springfield, Ohio.

GET OUR FREE SAMPLE CASE—Toilet articles, flavorings, soaps, specialties. Wonderfully profitable. LaDerma Co., Dept. SC, St. Louis, Mo.

AGENTS—Be a thousand miles ahead of competition. Patented product housewives want. Commission in advance if wanted. Comptroller, Box 929, New Orleans, La.

AIRPLANE SUPPLIES

MODEL AIRPLANE BUILDERS—Send for FREE CATALOG, Model Airplane Supply, 43 North Avenue, New Rochelle, N. Y.

BUSINESS OPPORTUNITY

CASH FOR YOUR PROPERTY, Farm Business or residence, no matter where located; free information. International Realty Co., Ford Bldg., Detroit.

CHALK TALKS

Laugh Producing Program $1.00. Catalog 10c. Baldt Art Service, Dept. E., Oshkosh, Wis.

CAMERAS—SUPPLIES

GERMAN CAMERAS, lenses. Bertra, 139 W. 3rd St., Los Angeles, Calif.

DETECTIVES

DETECTIVES Earn Big Money. Excellent opportunity. Experience unnecessary. Particulars Free. Write, George Wagner, 2190-B Broadway, N. Y.

INSTRUCTION

I CATCH from 45 to 50 foxes in from 4 to 5 weeks' time. Can teach any reader of this magazine how to get them. Write for particulars. W. A. Hadley, Stanstead, Que.

MISCELLANEOUS

TOBACCO OR SNUFF HABIT cured or no pay. $1.50 if cured. Remedy sent on trial. Superba Co., T-38, Baltimore, Md.

MOTION PICTURES

MOVIE FILMS, Standard Gauge, 250 ft. Western or Comedy, $1.00 Postpaid. Home Movie Supply Co., Box 744, Minneapolis, Minn.

OPPORTUNITY

101 WAYS TO MAKE MONEY. Particulars free. C. Terry, 1964 W. 7th St., Brooklyn, N. Y.

GOOD STANDARD MOVIE FILMS, 300 feet, $1.00. Samples. Particulars free. Eastin Feature Films, Dept. S, Galesburg, Ill.

PHOTOGRAPHIC ENLARGEMENTS

Send me 40c and negative and receive by return mail beautiful 8 x 10 glossy finish enlargement. Other photographic work at lowest prices. Send for circular to Charles, 210 Chestnut St., Camden, N. J.

SONG POEM WRITERS

SONG POEM WRITERS. Melodies written and arranged for publication. Write, Ernest Stonfeld, 2236 Olive Ave., Pasadena, Calif.

SONG POEM WRITERS—"Real" proposition. Hibbeler, D189X, 2104 N. Keystone, Chicago.

DAILY BUS TRIPS

through August and September to Playland Park Rye, N. Y. Leaving Fordham Road and Valentine Avenue. Parlor cars available for all occasions.

Phone Lorraine 3745 or Write

FORDHAM BUS CORPORATION
3815 Ninth Avenue New York, N. Y.

Home-Study Business Training

Your opportunity will never be bigger than your preparation. Prepare now and reap the rewards of early success. Free 64-Page Books Tell How. Write NOW for book you want, or mail coupon with your name, present position and address in margin today.

☐ Higher Accountancy
☐ Modern Salesmanship
☐ Traffic Management
☐ Railway Station Mgmt.
☐ Railway Accounting
☐ Law—Degree of LL.B.
☐ Commercial Law
☐ Industrial Management
☐ Banking and Finance
☐ Telegraphy
☐ Business Management
☐ Business Correspondence
☐ Credit and Collection Correspondence
☐ Modern Foremanship
☐ Personnel Management
☐ Expert Bookkeeping
☐ C. P. A. Coaching
☐ Business English
☐ Commercial Spanish
☐ Effective Speaking
☐ Stenotypy—Stenography

LaSalle Extension University, Dept. 1329-R Chicago

CHEMISTRY

IF you are interested in chemistry you will be pleased to hear that a magazine written in plain English, containing a vast amount of information for the beginner and the more advanced student in chemistry is being published now.

Chemical Experimenter

is a Monthly Magazine chock full of interesting departments, edited by men who know how to state worth-while facts.

There are departments about:

"Chemistry in the Home" —"History of Chemistry"—"Experiments in Chemistry"—"Biographies of Celebrated Chemists"—"Chemistry for the Beginner"—etc.

Send the coupon below and you will receive all information about this magazine.

Chemical Institute of New York — S-3
16 East 30th Street, New York City

Gentlemen:

Please send me, free of charge, all information about

CHEMICAL EXPERIMENTER

Name .....

Address .....

Town ..... State .....

The Musical Sensation
ACCORDEON
Played by Music Rolls

Without any knowledge of Music or Notes you play in a few minutes, perfect like an artist, latest hits, songs and dances. Every instrument guaranteed. Interesting Booklet No. 0 and roll list mailed free.
TREASURE GALES CO., 4000 Boston Road, New York

STOMACH-ULCER SUFFERERS

Quickly relieved Gastritis Acidosis Dyspepsia Indigestion

Many thousands of sufferers, even severe cases of years' standing, after taking Udga Treatment, report amazing recovery. Gnawing pain, vomiting, and other distress go AT ONCE. No diet. QUITE NOTHING unless you are more than satisfied. Complete treatment on 10 days' trial. Write for Free Booklet telling of proofs from grateful sufferers and FREE 10 DAYS' TRIAL OFFER.

UDGA LABORATORIES CO., 332 Eastern Parkway, Brooklyn, N.Y.

TO OUR READERS

A few copies of the June, July and August issues of

SCIENCE WONDER STORIES

Can still be had at the regular price of 25c each. Send cash, stamps or money order to

SCIENCE WONDER STORIES
96 Park Place
New York, N. Y.

The Reader Speaks

(Continued from page 378)

Einstein looks outward to a world of physical phenomena and from that builds up the Plan. The religious leader sees the working of a Plan within ourselves and finds that Plan confirmed by his knowledge of physical phenomena. Anything that frees the mind and frees the spirit is good and desirable no matter by what name it is known.—*Editor*).

Don't Do It Again!

Editor, Science Wonder Stories:

I have the July issue of your new Science Wonder Stories, the one with the ship on the cover. May I comment on it?

I like the general make-up of it very much, though there seems to be too much ink on the illustrations. They are very dark. I have no criticism to make on the stories and their authors, but . . . .

(1) The Cover. It is very misleading, as it does not have a bearing on any story, and not much on the article (as I can see). An editorial doesn't warrant an illustration, even if it is by you. (Praise). Besides the cover is too . . . . well, too ordinary—commonplace. Oh! Mr. Gernsback, don't do it again. Wouldn't "The Alien Intelligence" have made a much finer illustration? Wouldn't it now!

So, Paul, here's to more fantastic and startling cover drawings. The more daring the better. That's what ye all (most of us) want. Your illustration for "The Moon Pool" long ago was marvelous. And, Mr. Gernsback, I hope that formidable array of scientists you have as associate editors won't influence you otherwise. You probably know what you're about, though, but remember you have competition.

(2) The Paper. Why, oh why, do you insist on giving us a magazine so bulky? Make it thinner, even if you use cheaper paper. Make it thinner. The Quarterlies are the worst offenders in this line.

(3) The Table of Contents. It's a table of contentment, but only for stories, articles, and the Science News department in it. Leave out the questionaire, Reader Speaks, etc.

(4) Other Publications. If you put out so many different books and magazines like the Quarterly and Science Fiction Series, won't you run out of stories? That would be tough. . . . . No. It would be good. Then you could publish a lot of reprints like Cummings' "Girl in the Golden Atom," England's, Flint's, and Austin Hall's tales. Why don't you print more of H. G. Wells, also? He wrote plenty. Anyhow, don't overdo publishing science fiction on account of your readers not being able to keep up with you. I would like to see more shorter stories.

By the way, why have you quit using the word scientifiction, when you popularized it? Is that word copyrighted? If it is, it shouldn't be. Anybody ought to be able to use it.

Don't put any articles in a fiction magazine unless they are as good as "The Problems of Space Flying." I see "The Ark of the Covenant" is heading for Air Wonder Stories. This is one of the best works of scientifiction there is.

Lester Anderson,
Hayward, California.

(The editor is genuinely grieved that Mr. Anderson did not like the cover for the July issue. Most readers who wrote in thought it was good.

Truthfully we don't mind his saying that he didn't like it, that it wasn't truthful, that it was too flamboyant. But to have him say it was "too commonplace" is surprising. For commonplaceness is what we are desperately trying to escape from. And if Mr. Anderson is right then "it shall never be again." We therefore invite the comments of our readers to this question. "Was the July cover too commonplace?"

The word "scientifiction" is a trade symbol.

The other of Mr. Anderson's comments were duly appreciated. They were brief, sensibly stated and sincerely felt.

Regarding the masterpieces of science fiction we have many in store for our readers, as for example, "The Human Termites" in this issue. The stories to come in Science Wonder Stories will make a new high water mark in the production of science fiction. A word to the wise: *Save all your issues.*—*Editor*).

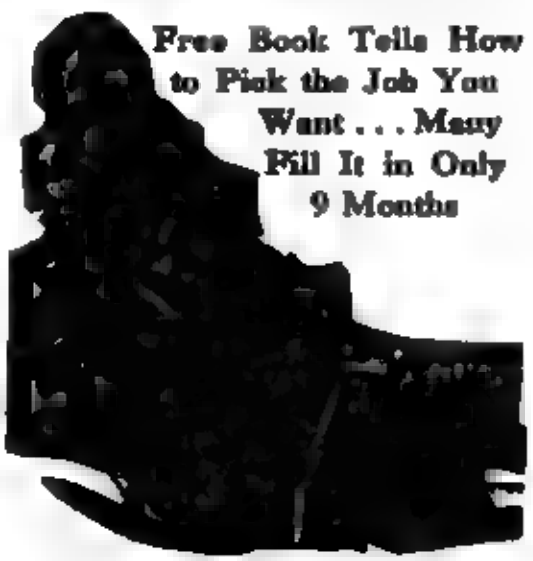
(Continued on page 380)

Why toil for small wages?

RADIO

offers you

BIG PAY!



Free Book Tells How to Pick the Job You Want . . . Many Fill It in Only 9 Months

MAKE more money than you ever made before . . . in radio . . . the big-money business of today. Men like you now earn from $2,000 to $25,000 a year in this giant money-making industry. Broadcasting stations and manufacturers now eagerly seek capable graduates. New and amazing opportunities by the thousands.

Magnificent Laboratory Outfit Makes It Easy to Learn at Home

This marvelous simplified home-training course sponsored by the Radio Corporation of America prepares you for success in every phase of radio. You learn by actual practice how to solve every problem in radio work . . . repairing, installing and servicing. That's why you too, upon graduation, can have the confidence and ability to command big money. Only training course backed by Radio Corporation of America. Graduates of this school are always in big demand. The progress of Radio is measured by the accomplishments of the Radio Corporation of America. This gigantic corporation sets the standards for the entire industry and sponsors every lesson in the course.

Money Back If Not Satisfied

This marvelous home-laboratory training practically insures your success. As a student, you will receive an agreement signed by the president of this school assuring you of complete satisfaction upon completion of your training—or your money will be instantly refunded.

Free!

This fascinating book on Radio's glorious FREE opportunities . . . written by one of America's well-known radio experts.

RADIO INSTITUTE OF AMERICA
Dept. R W 9, 326 Broadway
New York, N. Y.

Gentlemen: Please send me your FREE 36-page book which illustrates the brilliant opportunities in Radio and describes your laboratory-method of guaranteed instruction at home.

Name _____

Address _____

_____

AIR WONDER STORIES

The Future of Aviation

Big Magazine
Size 9 x 12 in.
100 Pages
4-Color Cover

25c
The Copy
On All Newsstands

THE only Aviation Magazine containing Science Fiction—Stories of the Future—Stories of Atomic Rays—Fourth Dimensions—Gravity Nullifiers—Future Warfare—Adventure and Inventions.

Contents of September Issue:

FLIGHT IN 1999
By "Bob" Olsen
THE AIR TERROR
By Lowell Howard Morrow
THE ARK OF THE COVENANT
(Part III)
By Victor MacClure
THE YELLOW AIR PERIL
By Harl Vincent
WHERE GRAVITY ENDS
By Robert H. Leitfred
AVIATION NEWS OF THE MONTH
AVIATION FORUM
THE READER AIRS HIS VIEWS
(Letters from Our Readers)

SPECIAL SUBSCRIPTION PRICE
8 ISSUES FOR $1.00

STELLAR PUBLISHING CORPORATION
Dept. S.-9, 98 Park Place, New York, N. Y.

Enclosed please find $1.00 for which send me the next eight issues of Air Wonder Stories.

Name .....

Address .....

City ..... State .....

The Reader Speaks

(*Continued from page 379*)

Baffles His Friends on Science Knowledge

Editor, Science Wonder Stories:

My apologies for not sending in my views sooner, but better late than never is my motto. I am one of your younger readers. I want to say that the magazine is a wonder. I've got my friends baffled on the superior knowledge of science I have over them.

Now a few criticisms and questions since they are less than the good parts.

In "The Feminine Metamorphosis," the wonderful woman biologist changed the women in shape and countenance. Don't you think that at the same time their views would change to those of a male? It certainly seems logical.

And then again, please ask Dr. Keller why Detective Taine never grows old. I remember in the last story he was in, the events took a considerable time and at the end he was very old. Yet here he is apparently none the worse for the years he has lived.

I didn't like "The Reign of the Ray," it was too "dry." "The Moon Beasts" was great. Give us more of Locke. "The Alien Intelligence" was a very good story.

That new author, D. D. Sharp is good, don't let him get away. His "Eternal Man" was one of the most interesting stories I've read so far, even though it is short.

Guess this is enough for some time. Will write next month. With best wishes for a successful magazine,

Sidney Rishen,
Brooklyn, N. Y.

(Mr. Rishen's question about the women in the "Feminine Metamorphosis" was very well put. The answer is that sex is determined by two sets of characteristics called the psychical and physical. The psychical are the basic qualities of the feminine nature such as mother love, vanity, capriciousness, unstability, desire for love and affection, etc. The physical characteristics are the more obvious physical ones such as feminine organs, size and shape of body, coloring and type of skin, tone of voice.

Now as we understand it, what happened was that only the secondary characteristics were changed by the biologists. The primary basic characteristics remained the same.

Dr. Keller's "Taine" is one of those characters who suffer a great many adventures. Therefore, what happened in the "Feminine Metamorphosis" may be simply an incident sandwiched in between those Mr. Rishen referred to.—*Editor*).

From A Prize Winner

Editor, Science Wonder Stories:

I just this evening opened my latest issue of Science Wonder Stories, and you can imagine what an agreeable surprise it was to find that my attempt at an essay had been awarded first prize for the third month of the contest on "What Science Fiction Means to Me." It is not every day that an individual finds that $50 has been unexpectedly dumped into his lap, so to speak.

I think that it was a very agreeable feature of your contest not to let the author of a prize-winning letter know of his good fortune until he has had a chance to find it out through a casual perusal of the pages of the magazine. The surprise is much more pleasant than if he had been notified by letter beforehand.

I shall naturally be glad to get the $50 when it arrives, but the most gratifying of all is the fact that my humble effort was deemed worthy of being given the honor of first place in a contest of such a nature, and when so many far more intelligent and experienced people than I sent in their splendid contributions at the same time.

F. P. Swiggett, Jr.,
Las Vegas, New Mexico.

(We feel that Mr. Swiggett need not apologize for his letter. It was a good one in every sense, being concise, expressed in clear, understandable language, sincere and *personal*. Many letters had to be regretfully passed over because although they expressed good ideas on science fiction in general, the personal element, the what-science-fiction-means-*to-me* was missing.—*Editor*).

(*Continued on page 381*)

The Reader Speaks

(Continued from page 380)

Terrible!

Editor, Science Wonder Stories:

Considering the facts, I fail to see how I am to congratulate you upon your new magazine. To begin with, as I did not see any June issue of the kind I don't have any idea whether it was better or worse than the issue of July and in my opinion it could not have far to go to be any worse. I received the issue of July O. K. and was very glad to do so until I opened it, whereupon I was frankly disappointed. I had not counted upon this business of "A Story in Two Parts—Part I" or "A Story in Two Parts—Part II" and to those please note, *Terrible*. Under certain circumstances it is O. K. It is even expected, but in the case of the story "The Reign of the Ray." I cannot see the necessity of dividing the story into two parts as you have done, the second part of the story is only 30 pages long and most certainly could have been put in one installment. The story "The Alien Intelligence" is quite a good story spoiled by dividing it into two parts, although it may be necessary. There are some stories which are much better if issued in serial form but that depends upon the type of the story. "The Moon Pool" was such a story and a very good one it was.

As I said before I was frankly disappointed upon not receiving my June issue and upon seeing the lack of complete stories in the July issue. Another thing I did not like was "The Problems of Space Flying." I will admit that I read it through and found it worthy of notice; in fact it is worth much study—it is the principle of the thing that I'm interested in. It's like this, if I want to for any reason study such it would not be a hard task to get something on the subject in the library or some such place as that, therefore I do not like the idea of buying a book to read for pleasure and relaxation only to be faced by some such discourse which reminds one of Einstein's theory or something equally interesting. The other stories seem all right but they certainly could be better by far. "Science News of the Month" is an excellent feature. I also enjoyed the prize letter contest and congratulate you upon the excellent choice of first prize. I always enjoy the readers' letters and have discovered that many of them show actual signs of intelligence although I have my doubts about some of them. I for one don't see anything to this picture and biography idea which some of them suggested, neither can I see why Sir Shillito Columbo Insomnia be in a very good setter.

Until lately there was never an issue of your former magazine that I did not read from cover through and for a long time I had one of every issue ever got out, and if it's worth it, I intend to do so with Science Wonder Stories also.

Science Wonder Stories seems to be a pretty good book, but it certainly can be improved upon and I suggest—More complete stories. 2—No short serials. 3—Purge the authors and their histories. 4—More stories and better ones. 5—Futuristic stories and those involving the dimensions. 6—And a lot concerning Interplanetary travel.

DeVere Shillito,
Beaver Falls, Pennsylvania.

(We feel withered under Mr. Shillito's indictment. At least that is the first sensation. But then we must calmly reread his letter and analyze it. Our fighting spirit is aroused now and we will defend Science Wonder Stories. But only where it will bear defense. If Mr. Shillito is right, we must admit it.

In the case of the "Reign of the Ray" or any other story Mr Shillito should remember that the size of the book is definitely fixed at 96 pages. If therefore we had run the ten extra pages to finish completely the story we would have been obliged to leave out some other story. Which wouldn't have been fair to our readers.

We believe that Mr. Shillito is mistaken about being able to get the "Problems of Space Flying" easily. We brought this book over from Germany at a great expense, had it translated here and illustrations were made before we could assemble it for publication. But we are very much interested in Mr. Shillito's criticism and because he has something to say we invite him to write us again.—*Editor*).

From a Lover of Astronomy

Editor, Science Wonder Stories:

Your first issue has so affected me as to cause me to write and wish you the best of success in your new undertaking. It was certainly a very fine one, and interesting as well. Needless to say, I have become a regular reader and booster of your magazine although I buy my copies on the newsstand.

I notice that you have most of the good authors with us and also some new ones who seem to know their science fiction. Now if you could only induce Edgar Rice Burroughs to join up with you, everything would be "jake."

Don't hesitate at all about reprinting some classics by Jules Verne or any of the old masters. They are always welcome and appreciated.

Above all, "more interplanetary stories!"

I do not hesitate to say that I am fiercely fascinated by the study of astronomy. And your magazine has done quite a lot to promote that feeling. I have studied astronomy in my leisure time for several years and have received a great deal of pleasure and knowledge from it. I would be glad to correspond with anyone who is also interested in astronomy. I am seventeen years old. I have nothing to say about the "*Science News*" Department except that it is quite interesting. I would like to see more astronomical news.

I notice by way of your advertisements that you are the publishers of a number of magazines on the different subjects, such as radio and aviation magazines, etc. Well, why not add to your list of publications a magazine based wholly on interplanetary stories, which might be called "Interplanetary Stories Magazine." By this time you realize that most of your readers prefer the interplanetary type of story. I can see no reason in not accommodating them. I believe that the science of astronomy is more interesting, and, to my mind, even more important than the science of aviation or radio. And I don't see why the science of astronomy could not be presented by an astronomical fiction magazine. I am certain that it would stand upon its own feet!

And now I would like you to consider this problem. Most interplanetary authors, in transporting their characters from our earth to different planets, use, as a means of traversing the void separating these bodies, space ships. The authors have recognized most of the obstacles and dangers standing in the way of space explorers, and have eventually explained them or else have left them for the reader to solve. Some of these obstacles are of such a nature as to make them probable of being solved or overcome in the future. They are: the nullification of gravity; proper amount of velocity on starting; friction from earth's atmosphere; travelling at speed of light, etc.

Now, after a great deal of thinking and much discussion over the various obstacles of space travelling, my friend and I have come across another obstacle and try as we might, we could not give any satisfactory explanation to overcome it. Perhaps you have heard it before or thought of it; but I am vitally interested in getting it solved (if possible).

We know that the air about us presses down upon everything with a weight of approximately 15 pounds per square inch. We also know that there is a corresponding pressure exerted from our body which quite neutralizes the air pressure. If this pressure was not exerted by us, the air pressure would be so great that we would cave; our bodies would simply fall in. The same way about if the air did not exert the pressure that it did upon us, we would burst from the pressure exerted within us.

Now travelling in a space ship, we would have life-giving air within the ship, which would press upon the occupants and even the ship with a weight of 15 pounds per square inch. As the space surrounding the space ship could give back no corresponding pressure to neutralize it, it stands to reason that the ship would bust from the inside. Which is an example of what our bodies would do, if we had no pressure from the air.

We have conjectured upon it very much, but without success. What do you think about it?

And now I believe I will stop as I have already wasted much of your time (if you have read it until here)

Again I wish you the best of success in your undertaking.

Joseph Fox,
Philadelphia, Pa.

(Continued on page 383)

LEARN BY DOING

Every phase of all branches

Electricity

taught by

Actual Practice

In America's foremost and oldest institution for trade training

No Books Used

Individual Instruction

Any man who can read and write and can get a pair of gloves can become an electrical expert and free himself forever from the long hours and drudgery of a small pay job.

ELECTRICITY

The Lifeblood of America's Industrial Expansion

And you can learn the BIG PAY profession of electricity right in New York City—the heart of the electrical world—the city of 100,000 jobs. At the same time you are learning the BIG PAY profession you can be enjoying the sights and wonders of New York, the richest city in the world.

Be an Electrical Expert

The graduates of the NEW YORK ELECTRICAL SCHOOL are in demand by all the big electrical companies. Or, if you prefer the independence of a business of your own, there are thousands of opportunities for efficient, dependable men to become electrical contractors. When you are your own boss the money you can make is limited only by your own energy and ability.

Personal Instruction

The NEW YORK ELECTRICAL SCHOOL is not a correspondence school. You learn by doing—by personal instruction on full size standard electrical equipment under the personal supervision of trained instructors.

At N. Y. E. S. you train your hands and mind at the same time. You learn the theories of electricity—and then you are shown how to put the theories into actual practice by solving the problems with your own hands.

The man who has learned electricity by actually doing electrical work under intelligent personal instruction can go to any part of the world and be sure of a good living. There are N. Y. E. S. Graduates in all the countries of the world.

Write today for the 48-page booklet giving full information about the N. Y. E. S. Course and showing pictures of the equipment available for your personal use in our two seven-story buildings.

New York Electrical School
21 N.Y.E.S. Bldg., 17th Street,
New York

MAIL TODAY

THE NEW YORK ELECTRICAL SCHOOL
21 N.Y.E.S. Bldg., 17th Street, New York

Please send me FREE your 48-page booklet. It is understood that this request puts me under no obligation.

Name _____

Address _____

_____

The Reader Speaks

(*Continued from page 381*)

(We can agree with Mr. Fox that Astronomy is one of the most fascinating of sciences, and one of which we still know relatively little. The possibilities of our vast universe are as limitless as the universe itself, and the editor is willing to go on record as saying that somewhere in the universe are worlds *in which every conceivable thing, within the realm of nature has happened.* Regarding the pressure on the space flyer, Mr. Fox should realize the difference between it and the human body. Our bodies are made of plastic flesh within and over a framework of bone. Fifteen pounds per square inch is quite a large pressure for the flesh to endure, for it has little resistance. But a space flyer would be constructed of metal. Boilers in operation now use pressure of steam of 600 and 700 pounds per square inch inside, whereas outside is only the pressure of air. And only recently we learned of a boiler which will use a pressure of 1200 pounds per square inch. So the mere difference of pressure of 15 pounds per square inch in space is a trifle to the space flyer. Captain Noordung's article in this issue brings this point out nicely. —*Editor.*)

Mr. Pratt Not Anti-Soviet

Editor, Science Wonder Stories:

I note with considerable interest a letter from Mr. Maurice Rabinowitz in criticism of "The Reign of the Ray" in the August issue of SCIENCE WONDER STORIES. Permit me to say that I think this criticism is based on a wholly inaccurate view of the story.

It was not our intention to express either approval or disapproval of Bolshevism or Fascism; as a matter of fact we don't think much of either system. I suppose Mr. Rabinowitz draws his idea that we wrote the story from an anti-Soviet point of view from the fact that we had the United States and Italy fighting on the same side against the Soviets; from the fact that we said the Italians had considerable success; and from the methods of warfare we ascribed to Bolshevist Russia.

Now these things were put into the story not because we are anti-Soviet, but as a result of careful (and we hope, scientific) consideration of the possibilities of the case. To take up the point in order:

1—The war, as we outlined it. Nearly all European governments as well as our own, have refused to recognize the Soviet, and this recognition has been, in many cases, almost insulting. On the other hand, our own government and all those of Europe, maintain the most cordial relations with Fascist Italy. We considered that a war would be far more likely to occur between governments which are at enmity than between those which are friendly to each other. That's only common sense. Moreover, the Soviet represents a system radically different from any other in Europe, and if it ever got into the control of such fanatics as we have mentioned (for the sake of the story) it is not at all improbable that Russia would set out to clean up the world, as Revolutionary France did in the past.

2—The Italian victories in the story. Italy has a large army; it is, by the common judgment of military authorities, in a high state of efficiency; if a war were to come, it is only logical to suppose it would meet with success.

3—The Soviet methods of war. Every war in history goes to show that when a country is surrounded by enemies its methods of warfare take on a frantic and violent character—"anything to win." The Germans resorted to the use of poison gas; Napoleon levied on conquered provinces for soldiers and provisions without paying for them; General Sherman burned out Georgia; and so on. When a nation is fighting for life it has no scruples at all.

I trust that you will be able to bring this communication to the attention of the enthusiastic Mr. Rabinowitz; and I would like to ask him whether there are any other points on which he is hazy.

Fletcher Pratt,
New York City.

(We publish without comment this letter of Mr. Pratt in answer to Mr Rabinowitz. We open our columns to Mr. Rabinowitz in case he should like a rebuttal to Mr. Pratt.—*Editor*).

BOOK REVIEWS

THE EINSTEIN THEORY EXPLAINED AND ANALYZED by Samuel H. Guggenheimer, 326 pages, stiff cloth covers; size 5 x 7¼. Published by MacMillan, New York. Price $2.50.

Reviewing briefly a book which is a criticism of the Einstein Theory is quite an impossible task. What the present review can best do is to indicate what the book contains, the method of approach and its value to possible readers.

That Mr. Guggenheimer is equipped for his task, no one can doubt. His method of analysis is both clear and incisive. He rips his way through theories and abstractions seeking for their logical worth. In this book he takes the Einstein method of approach and proceeds to lay bare its logical faults. He finds in fact that the chief basis for the special Theory of Relativity—the constancy of the velocity of light irrespective of the speed relation between the source of light and the observer—is an hypothesis only. He claims that Einstein never proved it, or if Einstein did prove it, it came as a corollary to the theory that depended on it. Like a dog eating his own tail. The present reviewer finds that Mr. Guggenheimer's criticism is sound. The famous Lorentz equations which are the basis of the Special Theory of Relativity are undoubtedly based on something which is taken for granted.

Mr. Guggenheimer, however, becomes so enamored of his subject that he often wanders off into his own abstruse speculations leaving the reader far behind him. A great deal of concentration and more than an ordinary education is necessary to follow the writer.

The book, however, is exceedingly well-written for a scientific work. It suffers, however, from a lack of cohesiveness. If Mr. Guggenheimer had given in simple terms all that Einstein postulated as all his theories and then proceeded to analyze each, the reader might have been able to follow him with a feeling as to where it was all going to lead. But while one may agree with the independent conclusions arrived at by Mr. Guggenheimer he is apt to give up in weariness the attempt to discover what it is all about.

THE CURATIVE VALUE OF THE MIND, by Marcus Rosenberg. 48 pages, stiff cloth covers. Size 5¼ x 8. Published by Dean & Company, New York. Price $1.50.

This is one of the most curious books that the reviewer has had the pleasure of reading. In its ponderous style it is reminiscent of Kant, and the reasoning is at times as lofty as that of the famous philosopher. Especially the deductive reasoning to explain such mundane things as a cold or a headache. It is a combination of mysticism, transcendentalism and empirical medicine.

It is with a curious sense of futility, yet with a lingering hope, that one turns page after page searching for the beginning of what the title promises. Instead, the first half of the book is composed of a learned discourse on the fourth dimension, the laws of conservation of energy and matter, and the Quantum Theory. In the second part one gathers from the index that we are approaching the heart of the subject. The author treats of colds, headaches, vaccination and the formation of habits. But gather a few samples of the reasoning used to explain these bodily afflictions and the possibilities of curing them.

"Colds," he says, "have something to do with the nerves of smell. When the soul is not aware that it is in the body, respiration takes place irregularly, and the nerves of smell want to transmit the irregular breathing vibrations to the soul. Since the soul is not aware that it is in the body, the nerves of smell have trouble in reaching the soul. Hence the painful sensation known as cold (Note: Not *colds*) and sneezing results, representing the irregular breathing vibrations to which the nerves of smell were subjected."

An interesting theory of the nature of heat and light is presented in the idea that there is no heat in the rays of the sun or any other rays. The light rays striking an object release intra-atomic energy of the object in the form of heat. Therefore we do not receive heat, we generate it.

ALEXANDER GRAHAM BELL by Catherine Mackenzie, 379 pages, illustrated, stiff cloth covers; size 5¾ x 8½. Published by Houghton Mifflin Company, New York. Price $5.00.

This book is an interesting account of the life of the man known to be the inventor of the telephone. Written by one who spent a great many years with him, it is well documented and undoubtedly possesses all the facts about Bell's life that one would wish to know. In fact it possesses many more than most readers would wish to know. Miss Mackenzie appears to have been smothered by the mass of material she possessed and while she gives a surfeit of exact dates and facts she nowhere gives a real illuminating insight into the man.

The book has a great deal of interest, however for those unable to appreciate the mental attitude that greeted Bell's announcement of the telephone or "speech by telegraph" as it was called. Curiously enough, we learn that Bell did not have the equipment of an electrical expert. His ideas and feelings on the subject came from his knowledge of sound as applied to speech. He was in fact a life-long expert on elocution and was intensely interested in anything that related to speech. We find him instead of the typical inventor of that day, starving in a garret, a young, enthusiastic man with plenty of friends and enough money to keep the wolf from the door. It is said about him that *if he had known more about electricity* he would *never have invented the telephone.* Much of the book is taken up with the years consumed in patent suits directed against him and by him. There is also some interesting material on his less well known scientific experiments—on the graphophone, the heavier-than-air flying machine and on scientific breeding of animals. The description of the way in which the actual discovery of the working telephone came has value because of the light it sheds on the importance of chance in scientific discoveries.

AN HOUR ON HEALTH, by Morris Fishbein, M.D. 158 pages, stiff cloth covers. Size 4 x 7. Published by J. B. Lippincott & Company, Philadelphia. Price $1.00.

This book by the editor of the Journal of the American Medical Association is part of a one-hour series on various topics that the publishers are presenting. It is quite a commonsense collection of the best authorities on such subjects as exercise, diet, general living habits, digestion, sleep and vacations. Dr. Fishbein's counsel in all things is moderation. That applies to exercise, eating healthful things, taking cathartics, and breathing. One could hardly quarrel with his conclusions since they seem to be founded as much on the experience of normal living people as on abstruse medical science. While he praises golf as a form of relaxation and exercise for business men, he cites the fact that every year a number of enthusiasts drop dead on the links from heart disease. It was evidently a case of a good thing overdone.

Dr. Fishbein finds no great evidence to support the contentions of the vegetarians that their possibility of life is greater than meat eaters. Those who eat moderately of meat, he finds, have just as much chance for long life as the vegetarian. "And," he adds dryly, "Meat eaters make better company because they have a sense of humor."

The author treats most food fads contemptuously. He finds that they are based principally on the desire of some commercial interest to exploit a particular food. The raisin fad was one. A warfare between the "eat white bread" and "do not eat white bread" interests now rages. But what Dr. Fishbein does not and evidently cannot state, is that these fads are based on the authority of medical men, who conveniently make "discoveries." But he finds the American public constipated and gullible. They will accept anything as a panacea except right living. They are too busy for that. So the doctor concludes bluntly "What fools these mortals be."

Learn to Play Bridge *Well*

GOOD Bridge players are always popular—always in demand at parties—always invited everywhere. Social success as well as the thrill and pleasure of winning are yours when you play well.

You can learn to bid correctly—to win the greatest possible number of tricks with the cards which have been dealt—to avoid the common errors of bridge—from this course of instruction. It is simple, easy to understand and complete. It teaches you quickly.

3 De-Luxe Bound Books Including 75 Lessons A Complete Course By W. W. Wentworth

ONLY **$2**

Book 1—"Bidding." Book 2—"Playing Your Hand." Book 3—"51 Common Errors and How to Correct Them." All by America's foremost authority whose articles have appeared in Fashionable Dress Magazine and hundreds of newspapers throughout the United States. W. W. Wentworth makes Bridge easy. You can learn quickly. Money-back guarantee.

TECHNI-CRAFT PUB. CORP.,
66 Park Place, New York, N. Y.

Please send me W. W. Wentworth's complete course of instruction in Bridge—three de-luxe bound books containing 75 lessons in all for $2. I enclose bills, money order or check. If I am not satisfied, I shall return the books within five days after receipt and my money will be refunded in full and without question.

Name .....

Address .....

City .....

State .....

The Latest—The Best—The Lowest Priced!

For 25 years the management of this firm has sold merchandise by mail. This is our guarantee to you—
"We promise courteous treatment and prompt shipments."

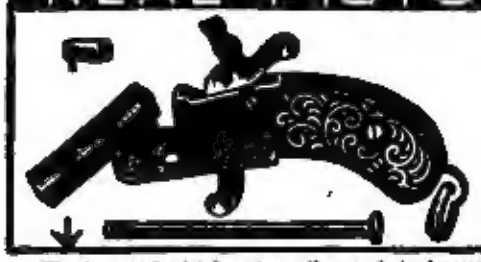
Order Direct From this Page

WE PREPAY ALL ORDERS ABOVE 50 CENTS.
(Remit Five Cents extra postage for all orders below 50c)

Money Refunded If Goods Unsatisfactory

Remit by check, money order or U. S. Postage stamps. Canadian and foreign stamps not accepted.

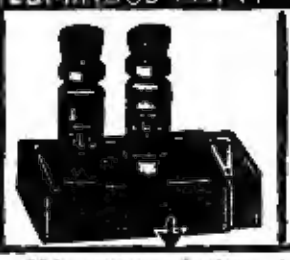
REAL PISTOL



Here's a real pistol, yet small enough to be used as a watch charm. Illustration is full size. Imported, best European workmanship. Excellent reproduction of standard pistol. Cut shows pistol broken open to load blank cartridge. When trigger is pulled, cartridge goes off with a loud BANG, that can be heard for a block. Pistol entirely made of steel, nickel plated. Handle is beautifully engraved. Octagonal barrel. Comes in box, with cleaning rod and 25 blank cartridges. AT NO EXTRA CHARGE.

No. 6500 Pistol.....Prepaid **$1.25**
No. 6500A Set of 25 Cartridges.....Prepaid **25c**

LUMINOUS PAINT



Make your own luminous articles. Paint watch and clock hands, electric light switches, push buttons, keyholes, house numbers, etc. 1,000 uses. Articles treated stand out brilliantly in dark. The darker the room, the more brilliancy.

No. 6501-A
Prepaid **25c**
No. 6500 Luminous Paint Large Size **$1.00**

MAGNIFIER

This fine folding pocket magnifying glass, also called linen tester, is made entirely of gold lacquer brass. Has powerful lens that magnifies everything 10 times. Has fixed focus. Just open it and it is ready. When folded this magnifier occupies a space about as large as a quarter and twice as thick.

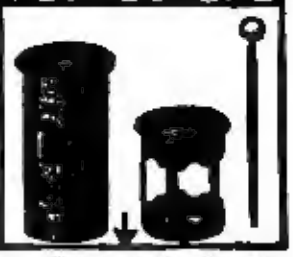
No. 6510 Magnifier
Prepaid **35c**

MICROSCOPE

Here is a real high power imported microscope for instruction and laboratory work. Has regulation rotating light mirror. Has adjustable lens for correct focusing. With it come 3 specimen slides. Entirely brass. Packed in neat leatherette box.

No. 6517 Microscope
Prepaid **$1.90**

FLOROSCOPE



This is a fine imported combination microscope. Really two instruments in one. One end used for high magnification, such as seeing bacteria in milk or water. Other end to see parts of insects, flower specimens, etc. Finished in gold brass.

No. 6519 Florscope
Prepaid **65c**

FOOLEM

Box of sponge rubber cigarettes. Can't be told apart when mixed with real ones. Get the laugh on your friends. Nothing like it. This is one of the cleverest novelties ever designed and is made exceedingly well. Even the ends of the cigarette look like real tobacco.

No. 6501 Cigarettes
Prepaid. Box **25c**

HOAX HANGER

Latest novelty out. This trick coat-hanger looks just like the regulation article. But try and hang a coat on it and—FLOP down it comes. Hanger has a spring hinge—even a hat pulls it down. Hanger is fastened to wall with nails or screws. Nickel plated.

No. 6515 Hoax Hanger
Prepaid **25c**

10¢ COMPASS 10¢

Fine imported magnetic compass. ACCURATE. Pocket size. Invaluable for hikers, automobilists. Often saves lives. Use it to tell live electric wires; make your own galvanoscope. Fully nickel plated. The actual article is about one-half again as large as illustration shows.

No. 6507 Compass
Prepaid **10c**

RUBBER!!

Cigar is made of sponge rubber. Fools everybody. Deception is perfect.

No. 6500 Rubber Cigar
Prepaid 15c.

Offer your friends or your girl some chewing gum—They try to chew it, till they find out its rubber! Five sticks to the packet

No. 6510 Rubbergum
Prepaid **10c**

BOOTLEG PUZZLE

A real sticker. Just try and get the bottle off the boot. It will take you quite a while till you master the intricacies of this clever puzzle. Made entirely of metal. Nickel plated. Size of this puzzle is 3½"x2¾".

No. 6518 Bootleg Puzzle. Prepaid **20c**

TRICK-SOAP

Loads of fun with this trick soap. Looks harmless and is intended to "get" the chap who always uses your soap. When he uses it his hands get black as soot and he needs real soap to clean his hands.

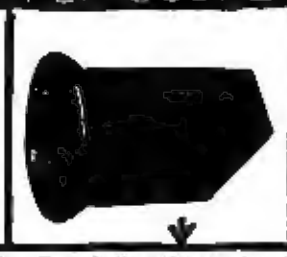
No. 6512 Trick Soap
Prepaid **15c**

BLUFFGUN

Bluff your friends with this ——. Made of gunmetal metal handsomely nickeled. Exactly same size, weight and shape as real article. Fine to bluff burglars. Used also as desk paper weight. Size of this gun is 6¼" long and 3" wide.

No. 6503 Bluffgun
Prepaid **60c**

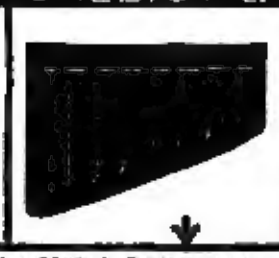
PERISCOPE



See what's going on behind your back with this Seebackscope. Used like a magnifying glass. No one knows you're watching them. Gives you "eyes in your back." This article is made in molded bakelite and its size is 2"x1½".

No. 6508 Periscope
Prepaid **10c**

CALLIOPE



Musical Calliope. Latest novelty. Made in celluloid, light weight. 4¼"x3". Eight keynotes produce perfect Calliope musical effect. Simple to play—just blow. Plays like Harmonica. Exceptionally loud. Finished in different, attractive colors.

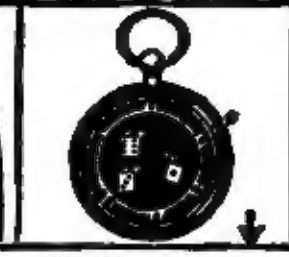
No. 6521 Calliope
Prepaid **15c**

NOSE FLOWER

The real article! Conceal nose blower in your handkerchief and blow into instrument while you pretend to blow your nose. Everyone stops and looks at you. There never was a terrible noise like it. Keep it up as long as you like.

No. 6516 Noseflower
Prepaid **10c**

DICE GAME



Real Dice game. Press lever on side. When released, dice spin around on green cloth. Smallest game of its kind. Built rugged-ly. Same size as your watch. Full nickel finish. Glass crystal. Has a ring to attach to your watch chain.

No. 6514 Dice Game
Prepaid **45c**

ROULETTE

Real roulette game. Proof lever and arrow spins around. Never stops twice on same number in succession. Same size as your watch. Fully nickel plated, glass crystal. Loads of fun. Has a ring to attach to your watch chain.

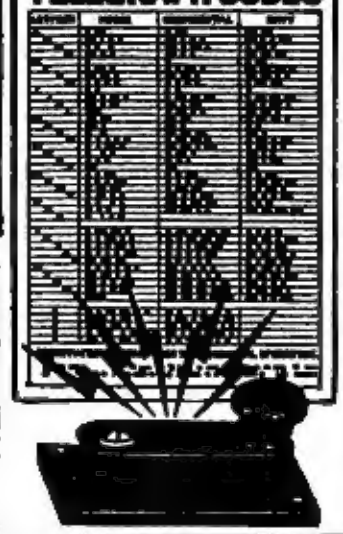
No. 6513 Roulette Game. Prepaid **45c**

OOH-LA-LA RING

Handsomely carved gold filled ring. Looks just like any other ring. But, oh boy, wait till you look through the "VIEW." Strong magnifying glass shows French actress when viewed against light. Ring has large imitation diamond. When ordering unless a strip of paper giving size of your finger.

No. 6517 Surprise Ring. Prepaid **35c**

TELEGRAPH CODES



NEW!! Telegraph 25c

For the astonishing small sum of 25c you can now learn telegraphy. Any wide awake boy or girl can learn the telegraph codes with this little outfit within from 30 to 60 days. Gives loud signals perfectly — nothing to wear out. No batteries. The instrument consists of hard fiber base, mechanical sounder and telegraph key knob. Screw to table or carry it in pocket. Guaranteed to give exact reproduction of telegraph sounds just like regulation sets. We also furnish free a set of telegraph codes as shown, and full instructions of how to learn telegraphy.

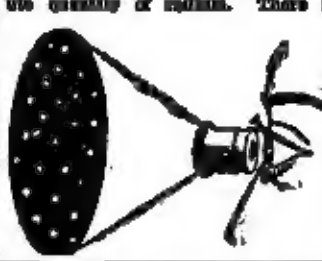
No. 6520
Telegraph Set
Prepaid **25c**

NEW!! Spintheriscope

Positively the most astounding scientific instrument ever developed. This instrument formerly sold from $1.00 to $50.00 upwards. Now it is possible to get it for a small sum. Witness actual destruction of thousands of Worlds by simply looking through the lens of the instrument. Actual radium is disintegrated before your eyes. You see the atomic bombardment plainly. Instrument is guaranteed to contain a minute quantity of radium. There is no more enthralling sight in the whole world than what you see in the Spintheriscope.

Nothing to wear out. Lasts forever. Adjust by extending lens to right focus and watch the spectacle.

No. 6524



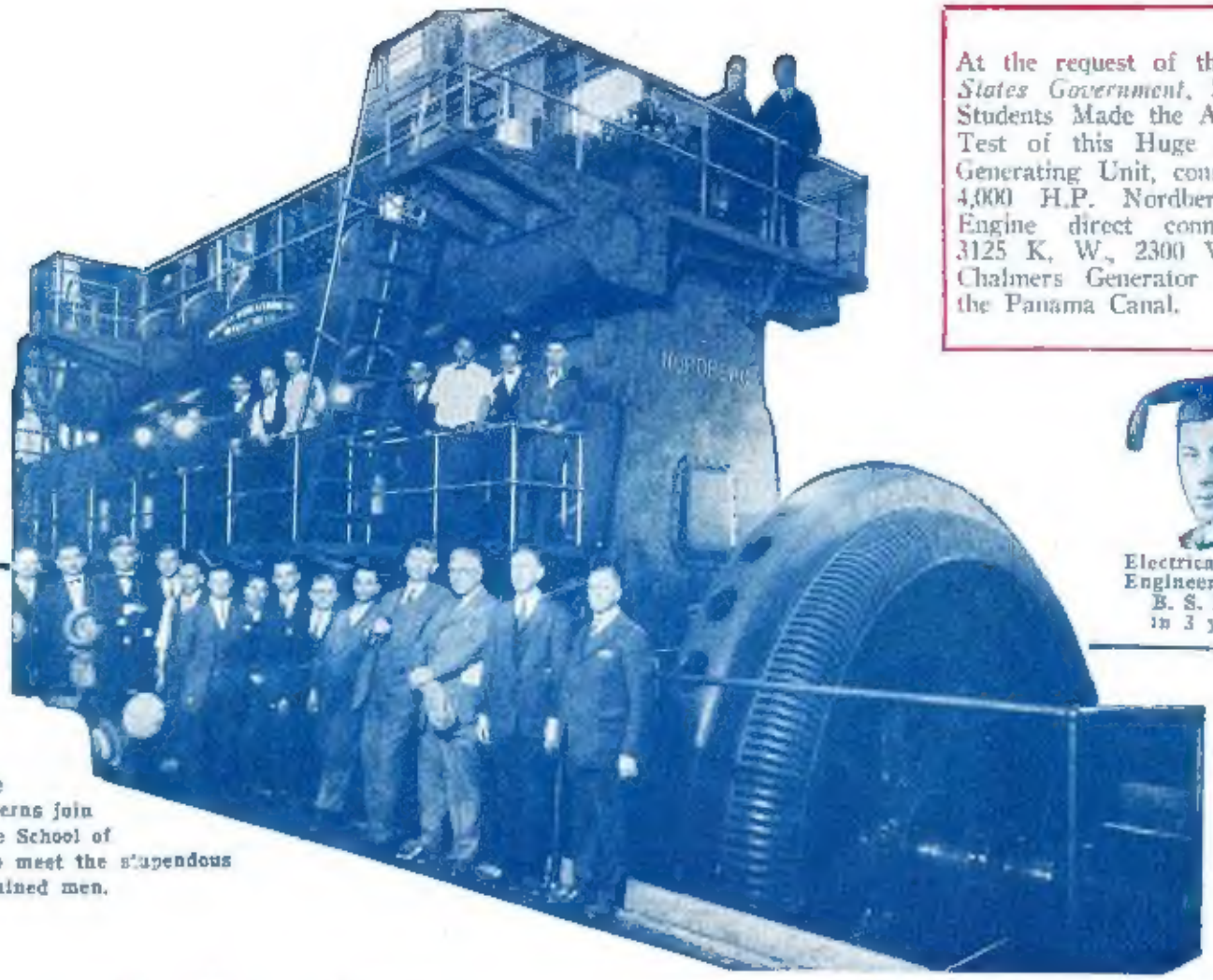
Spintheriscope
Prepaid **65c**

CIGARETBANG

Have boys is THIS novelty. Box contains a dozen tiny wood pegs—but they ARE "treated." Push the sharp end of peg into cigarette about 1/8 in. Pegs are so small they're invisible. Then offer your friends the cigarettes. BANG, BANG! they go off — Yet ENTIRELY HARMLESS.

No. 6520 Cigaretbang. Prepaid..... **15c**

SCIENTIFIC NOVELTY COMPANY, 245 Greenwich St., New York City



Big Milwaukee electrical concerns join hands with the School of Engineering to meet the stupendous demand for trained men.

At the request of the *United States Government*, S. of E. Students Made the Acceptance Test of this Huge Electrical Generating Unit, consisting of 4,000 H.P. Nordberg Diesel Engine direct connected to 3125 K. W., 2300 Volt Allis Chalmers Generator built for the Panama Canal.

Electrical Engineering, B. S. Degree in 3 years

Men of Action WANTED FOR Commercial Electrical Engineering

TAKES you out of the class of the common laborer of which there is always an over-plentiful supply at cheap rates of pay. Makes you a **Graduate Electrician, Junior Electrical Engineer,** or **Commercial Electrical Engineer** in 12 short months. Puts you in line for a job where big manufacturers are actually pleading for trained men and glad to pay **Big Salaries** ranging from $2,000 to $10,000 a year. Not a dream—**A DEAD SURE FACT!** For 25 years we have trained men for the electrical profession and **Our Graduates Have Succeeded in All Parts of the World.** Our 12 months intensive training is the boiled down essence of what **We Know** fits men for big paying positions. It is work you'll love. **No limit** to advancement. **Practical engineers teach you.** They know **What** to teach and **How** to teach it, **so you can earn money with it.** Hundreds of thousands of dollars worth of actual commercial machinery to work on in this school.

SCHOOL of ENGINEERING of Milwaukee
Founded 1905 A.W.S.-929 Milwaukee, Wis.

Uncle Sam Asks S. of E. OK!

Think of the opportunity to test plants such as this. The Nordberg Manufacturing Company is only one of many large concerns that is co-operating with School of Engineering students. This type of practical work, while in school, insures your future when you graduate. That's why our men are always in demand and always command big salaries. You can be one of these men if you ACT!

Earn While You Learn

By our special system you may earn part of your way while learning. Our Employment Department will help ambitious men who can finance their tuition to secure a position to which they may devote a part of each day, spending the remainder at the school. Low tuition fee. Board and room reasonable. Daily broadcasting WISN (formerly WSOE). School Orchestra. Fraternities.

Write for FREE Catalog

Write today for our free, illustrated catalog. Read about this wonderful institution and the great opportunities that lie before you. Find out about our specialized method of training and the details of our "Earn While You Learn" plan.

Radio and Electrical Refrigeration

Learn in three months — just 90 days and you can be one of the new group of trained men who will guide and develop the newest and best paying of America's gigantic industries. Radio and Electric Refrigeration are tremendous money makers for the trained man who gets into the game early. Experts are needed for big, responsible, well-paying jobs. We train you quick and help place you in a good position. ACT NOW!

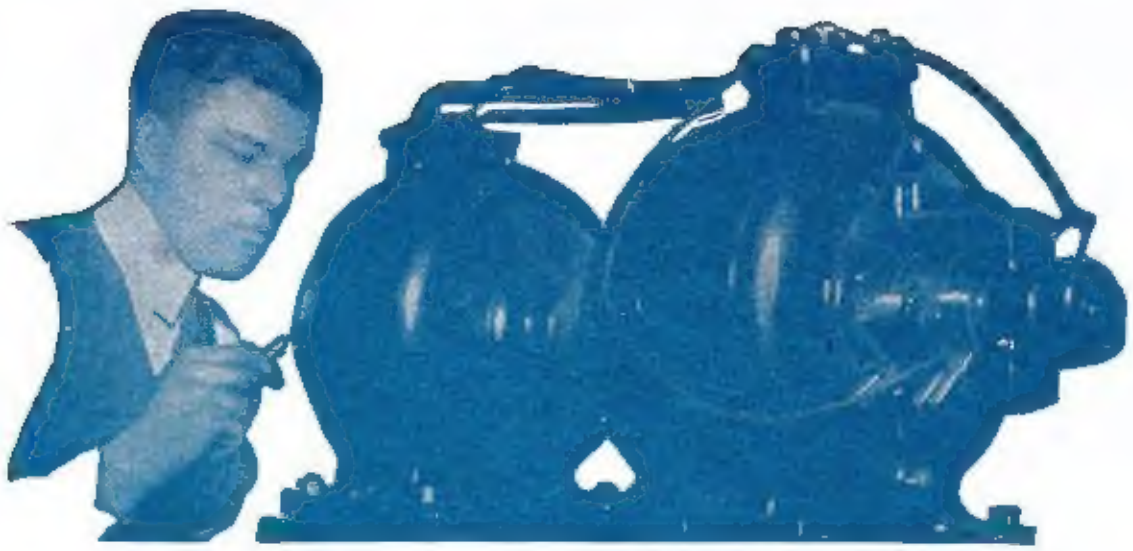
FALL TERM OPENS NOW

School of Engineering of Milwaukee,
Dept. A.W.S.-929, Milwaukee, Wis.

Without obligating me in any way please mail free Photo Story book, "Rise to Success Through Electricity" (just off the press), and NEW bulletin regarding the course I have marked with an X.

[ ]Commercial Elec. Eng. for High School Grad., 4 year
[ ]Commercial Elec. Eng. Others } in 2 years
[ ]Elec. Eng., B.S. Degree 3 yrs.
[ ]Automotive Elec.
[ ]Elec. Refrigeration
[ ]Radio
[ ]Armature Winding
[ ]Light, Heat & Power
[ ]Practical Electricity
[ ]Home Lab. Service
[ ]I am interested in your Earn While You Learn Plan.

Name..... Age.....
Address.....
City..... State.....
Education.....



Amazingly Easy Way to get into ELECTRICITY

Don't spend your life waiting for $5 raises in a dull, hopeless job. Now . . . and forever . . . say good-bye to 25 and 35 dollars a week. Let me show you how to qualify for jobs leading to salaries of $50, $60 and up, a week, in Electricity—NOT by correspondence, but by an amazing way to teach, that makes you an electrical expert in 90 days! Getting into Electricity is far easier than you imagine!

Learn Without Lessons in 90 DAYS

Lack of experience—age, or advanced education bars no one. I don't care if you don't know an armature from an air brake—I don't expect you to! I don't care if you're 16 years old or 48—it makes no difference! Don't let lack of money stop you. Most of the men at Coyne have no more money than you have.

Railroad Fare Allowed

I will allow your railroad fare to Chicago, and if you should need part-time work I'll assist you to it. Then, in 12 brief weeks, in the great roaring shops of Coyne, I train you as you never dreamed you could be trained . . . on the greatest outlay of electrical apparatus ever assembled in any electrical school . . . costing hundreds of thousands of dollars . . . real dynamos, engines, power plants, autos, switchboards, transmitting stations . . . everything from door bells to farm power and lighting . . . full-sized . . . in full operation every day!

No Books-No Printed Lessons

No books, no baffling charts . . . all real actual work . . . right here in the great Coyne school . . . building real batteries . . . winding real armatures, operating real motors, dynamos and generators, wiring houses, etc., etc. That's a glimpse of how we make you a master practical electrician in 90 days, teaching you far more than the average ordinary electrician ever knows and fitting you to step into jobs leading to big pay immediately after graduation. Here, in this world-famous *Parent school*—and nowhere else in the world—can you get such training!

Prepare for Jobs Like These

Here are a few of hundreds of positions open to Coyne-trained men. Our free employment bureau gives you lifetime employment service.

Armature Expert, to $100 a Wk.
Substation Operator $60 a Week and up
Auto Electrician $110 a Week
Inventor . . . . . Unlimited
Maintenance Engineer up to $150 a Week
Service Station Owner up to $250 a Week
Radio Expert up to $100 a Week

Jobs-Pay-Future

Dont' worry about a job, Coyne training settles the job question for life. Demand for Coyne men often exceeds the supply. Our employment bureau gives you a lifetime service. Two weeks after graduation Clyde F. Hart got a position as electrician for the Great Western Railroad at over $100 a week. That's not unusual. We can point to Coyne men making up to $600 a month. $60 a week is only the beginning of your opportunity. You can go into radio, battery, or automotive electrical business for yourself and make up to $15,000 a year.

New in Our New Home

This is our new, fireproof, modern home wherein is installed thousands of dollars' worth of the newest and most modern Electrical Equipment of all kinds. We now have the largest amount of floor space devoted to the exclusive teaching of practical electricity in the world. Every comfort and convenience has been arranged to make you happy and contented during your training.

GET THE FACTS

Coyne is your one great chance to get into electricity. Every obstacle is removed. This school is 30 years old—Coyne training is tested—proven beyond all doubt—endorsed by many large electrical concerns. You can find out everything absolutely free. Simply mail the coupon and let me send you the big, free Coyne book of 150 photographs . . . facts . . . jobs . . . salaries . . . opportunities. Tells you how many earn expenses while training and how we assist our graduates in the field. This does not obligate you. So act at once. Just mail coupon.

Get This FREE Book

Mr. H. C. LEWIS, President
COYNE ELECTRICAL SCHOOL, Dept. 79-01,
500 S. Paulina St., Chicago, Ill.

Dear Mr. Lewis:
Without obligation send me your big free catalog and all details of Railroad Fare to Chicago, Free Employment Service, Radio, Aviation, Electricity, and Automotive Courses, and how I can "earn while learning."

Name.....

Address.....

City ..... *State*.....

COYNE ELECTRICAL SCHOOL

H. C. LEWIS, Pres. Established 1899

500 S. Paulina Street • Dept. 79-01 • Chicago, Illinois